

DFI



PL610-C622
ATX Industrial Motherboard
User's Manual

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Changes after the publication's first release will be based on the product's revision. The website will always provide the most updated information.

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Trademarks

Product names or trademarks appearing in this manual are for identification purpose only and are the properties of the respective owners.

FCC and DOC Statement on Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

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Warranty

1. Warranty does not cover damages or failures that arised from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.
2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.
3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.
4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.



Important:

Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Measures

To avoid damage to the system:

- Use the correct AC input voltage range.

To reduce the risk of electric shock:

- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- One PL610-C622 motherboard
- One COM port cable (Length: 400mm, 2 x COM ports)
- One Serial ATA data cable (Length: 500mm)
- One I/O shield

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance to the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Optional Items

- USB port cable (Length: 398mm)
- Heatsink (Narrow ILM LGA 3647)

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance to the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Before Using the System Board

Before using the system board, prepare basic system components. If you are installing the system board in a new system, you will need at least the following internal components.

- A CPU
- Memory module
- Storage devices such as hard disk drive, etc.

You will also need external system peripherals you intend to use which will normally include at least a keyboard, a mouse and a video display monitor.

Chapter 1 - Introduction

► Specifications

SYSTEM	Processor	Intel® Xeon® Scalable Processor Family, LGA 3647 Socket, TDP up to 145W - Intel® Xeon® Gold 6138T/6138/6130T/6130/6126T/6126/5120T/5119T/5118 - Intel® Xeon® Silver 4116T/4116/4114T/4110/4109T - Intel® Xeon® Bronze 3106
	Chipset	Intel® C622 Chipset
	Memory	Six 288-pin RDIMM up to 192GB Single Channel DDR4 1600/1866/2133/2400/2666MHz
	BIOS	Insyde SPI 128Mbit
GRAPHICS	Display	1 x VGA
	Single Display	VGA
EXPANSION	Interface	2 x PCIe x16 (Gen 3) 2 x PCIe x8 (Gen 3) 1 x PCIe x4 (Gen 3) 1 x M.2 2280 M key (PCIe Gen3 x 4 NVMe/SATA)
	Audio Codec	N/A
	Controller	GbE: i350-AM2 10GbE: CS4227 IPMI: RTL8211F
	Ethernet	2 x GbE (RJ-45) 1 x dedicated IPMI LAN 1 x Fiber 10 GbE
REAR I/O	USB	2 x USB 2.0
	PS/2	1 x PS/2 (mini-DIN-6)
	Display	1 x VGA
INTERNAL I/O	Serial	1 x RS-232 (2.54mm pitch)
	USB	2 x USB 2.0 (2.54mm pitch) 1 x Vertical USB 2.0 2 x USB 3.0
	SATA	6 x SATA 3.0 (up to 6Gb/s)
	SMBus	1 x SMBus
WATCHDOG TIMER	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds
SECURITY	TPM	Infineon TPM 2.0 (optional)
POWER	Type	ATX
	Connector	8-pin ATX 12V power 24-pin ATX power
	RTC Battery	CR2032 Coin Cell
OS SUPPORT		Windows 10 IoT Enterprise LTSB RS1 (64-bit) Windows Server 2012R2 Windows Server 2016 Ubuntu 16.04
ENVIRONMENT	Temperature	Operating: 0 to 60°C Storage: -30 to 60°C with RTC Battery; -40 to 85°C without RTC Battery
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
MECHANICAL	Dimensions	ATX Form Factor 305mm (12") x 244mm (9.6")
COOLER	Heatsink	Narrow ILM LGA 3647 (optional)

► Features

Watchdog Timer

The Watchdog Timer function allows your application to regularly “clear” the system at the set time interval. If the system hangs or fails to function, it will reset at the set time interval so that your system will continue to operate.

DDR4

DDR4 deliver increased system bandwidth and improved performance at a lower power than DDR3/DDR3L/DDR2. It is not compatible with DDR3/DDR3L/DDR2.

PCI Express

PCI Express is a high bandwidth I/O infrastructure that possesses the ability to scale speeds by forming multiple lanes. The x4 PCI Express lane supports transfer rate of 4 Gigabyte per second (2 directions). The PCI Express architecture also supports high performance graphics infrastructure by enhancing the capability of a PCIe x16 Gen 3 at 16GB/s bandwidth (8GB/s in each direction).

Serial ATA

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 6Gb/s (SATA 3.0), it improves hard drive performance faster than the standard parallel ATA whose data transfer rate is 100MB/s. The bandwidth of the SATA 3.0 will be limited by carrier board design.

Wake-On-PS/2

This function allows you to use the PS/2 keyboard or PS/2 mouse to power-on the system.



Important:

The 5V_standby power source of your power supply must support $\geq 720\text{mA}$.

Power Failure Recovery

When power returns after an AC power failure, you may choose to either power-on the system manually or let the system power-on automatically.

USB

The system board supports the USB 3.0. It is capable of running at a maximum transmission speed of up to 5 Gbit/s (625 MB/s) and is faster than USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.0 reduces the time required for data transmission, reduces power consumption, and is backward compatible with USB 2.0. It is a marked improvement in device transfer speeds between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

Wake-On-LAN

This feature allows the network to remotely wake up a Soft Power Down (Soft-Off) PC. It is supported via the onboard LAN port or via a PCI LAN card that uses the PCI PME (Power Management Event) signal. However, if your system is in the Suspend mode, you can power-on the system only through an IRQ or DMA interrupt.



Important:

The 5V_standby power source of your power supply must support $\geq 720\text{mA}$.

Wake-On-USB

This function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.



Important:

If you are using the Wake-On-USB Keyboard/Mouse function for 2 USB ports, the 5V_standby power source of your power supply must support $\geq 1.5\text{A}$. For 3 or more USB ports, the 5V_standby power source of your power supply must support $\geq 2\text{A}$.

RTC Timer

The RTC installed on the system board allows your system to automatically power-on on the set date and time.

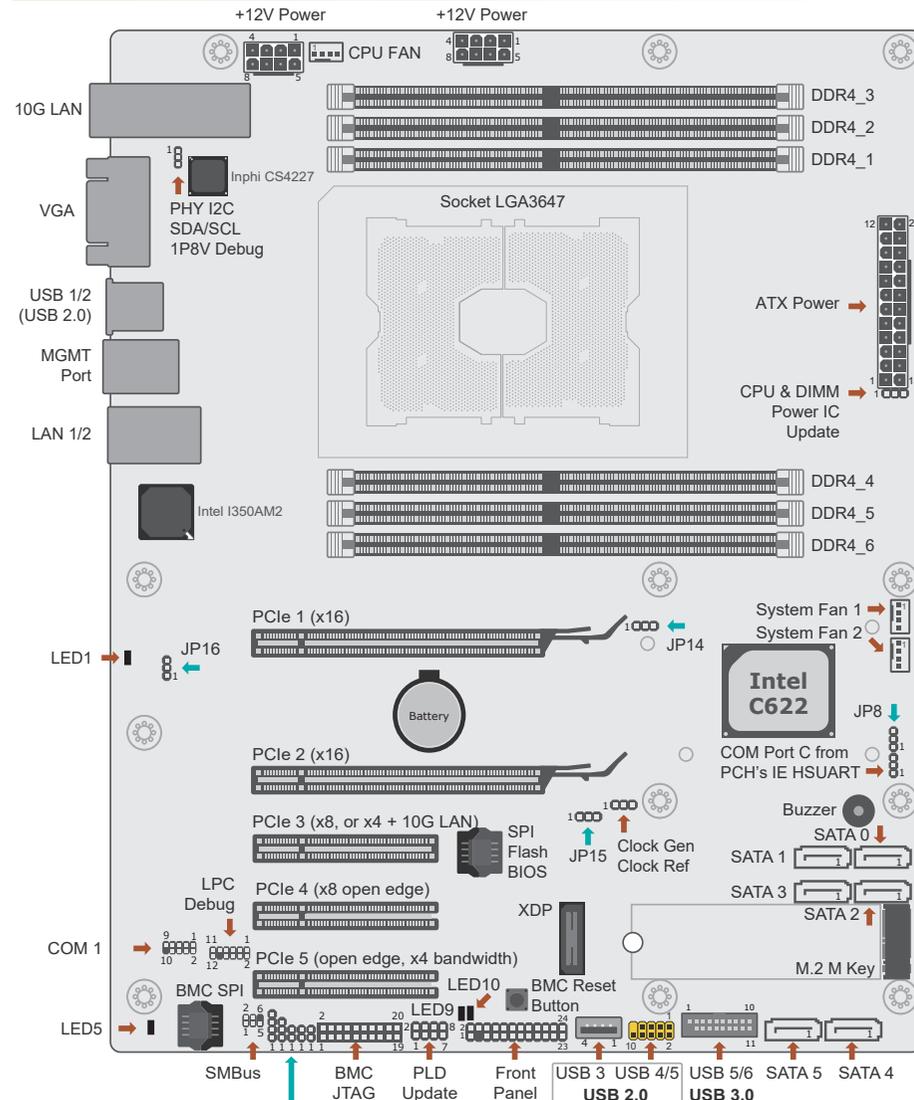
ACPI STR

The system board is designed to meet the ACPI (Advanced Configuration and Power Interface) specification. ACPI has energy saving features that enables PCs to implement Power Management and Plug-and-Play with operating systems that support OS Direct Power Management. ACPI when enabled in the Power Management Setup will allow you to use the Suspend to RAM function.

With the Suspend to RAM function enabled, you can power-off the system at once by pressing the power button or selecting “Standby” when you shut down Windows® without having to go through the sometimes tiresome process of closing files, applications and operating system. This is because the system is capable of storing all programs and data files during the entire operating session into RAM (Random Access Memory) when it powers-off. The operating session will resume exactly where you left off the next time you power-on the system.

Chapter 2 - Hardware Installation

► Board Layout



(from left to right) BMC UART5, RSVd CPLD UPDATE (JP11), Enable eSI (J14), UART Debug Select (JP2), BMC Password Clear



Important:

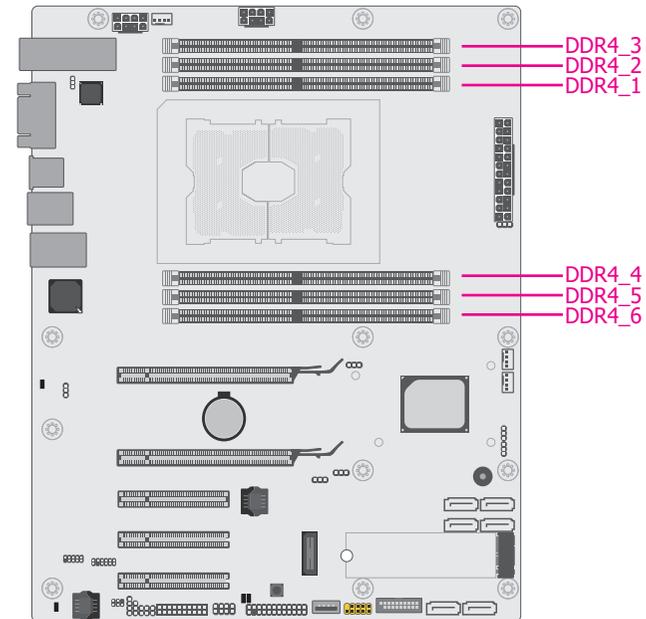
Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.



Important:

When the Standby Power LED lit red, it indicates that there is power on the system board. Power-off the PC then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the motherboard and components.

► System Memory



► System Memory

The system board supports the following memory interface.

Single Channel (SC)

Data will be accessed in chunks of 64 bits from the memory channels.

Single Channel

DIMMs are on the same channel. DIMMs in a channel can be identical or completely different. However, we highly recommend using identical DIMMs. Not all slots need to be populated.

Features

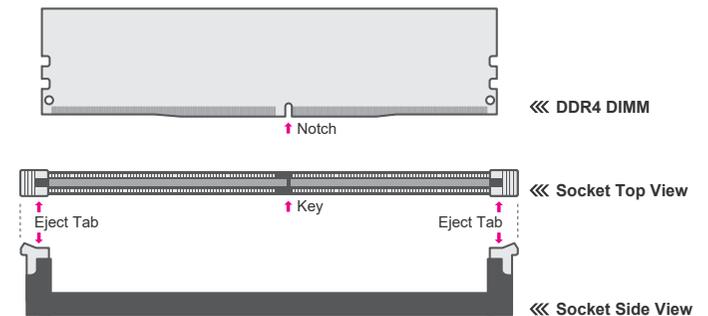
- Six 288-pin DDR4 DIMM
- Up to 1TB 3DS LRDIMM or 192GB RDIMM
- 2600/2400/2133/1866/1600MHz

► System Memory

Installing the DIMM Module

Before installing the memory module, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the DIMM socket on the system board
4. Make sure the notch on memory card is aligned to the key on the socket.



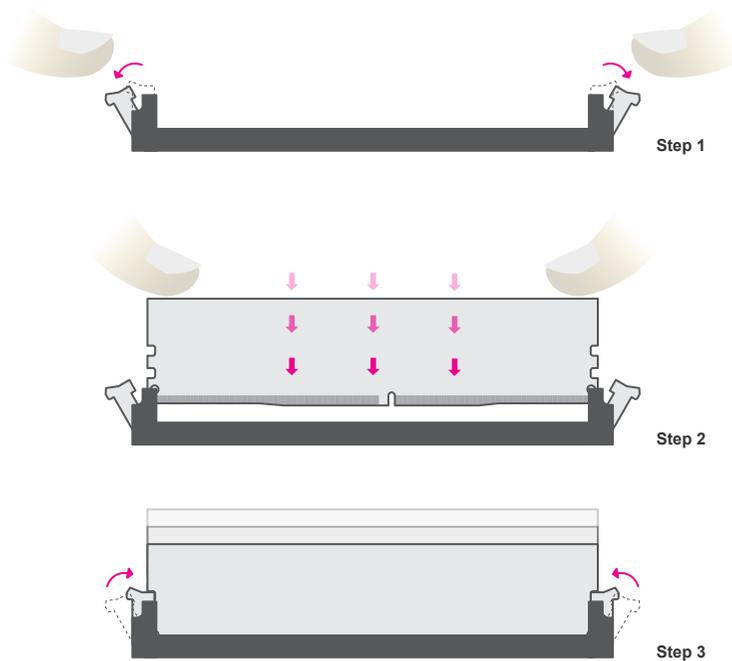
► System Memory ► Installing the DIMM Module

Please follow the steps below to install the memory card into the socket.

Step 1:
Press the eject tabs at both ends of the socket outward and downward to release them from the locked position.

Step 2:
Insert the memory card into the slot while making sure the notch and the key are aligned. Press the card firmly with fingers while applying and maintaining even pressure on both ends.

Step 3:
The tabs snap automatically to the edges of the card and lock the card in place.



► System Memory

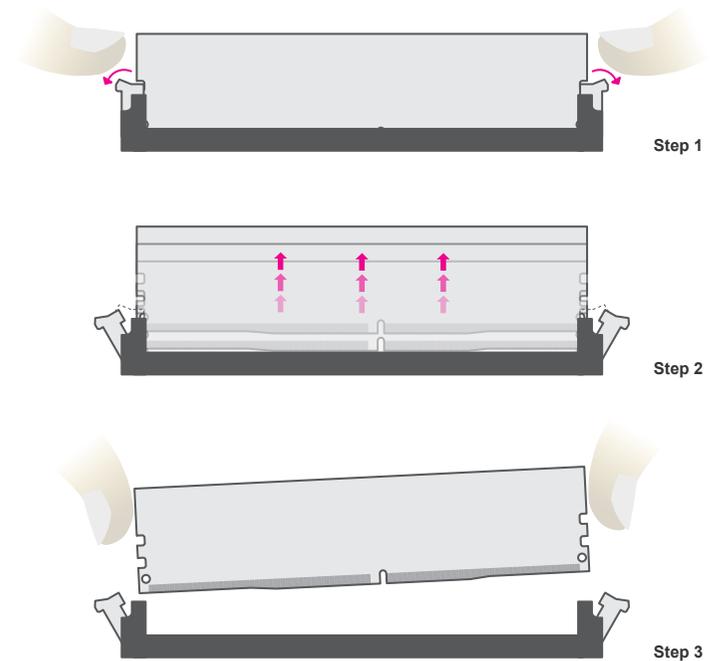
Removing the DIMM Module

Please follow the steps below to remove the memory card from the socket.

Step 1:
Press the eject tabs at both ends of the socket outward and downward to release them from the locked position.

Step 2:
The memory card ejects from the slot automatically.

Step 3:
Hold the card by its edges and remove it from the slot.



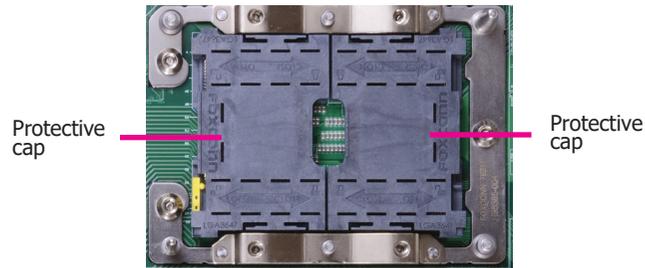
► CPU

The system board is equipped with a surface mount LGA 3647 socket. This socket is exclusively designed for installing a LGA 3647 packaged Intel CPU.



Important:

1. Before you proceed, make sure (1) the LGA 3647 socket comes with 2 protective caps, (2) the caps are not damaged and (3) the socket's contact pins are not bent. If the caps are missing or the caps and/or contact pins are damaged, contact your dealer immediately.
2. Make sure to keep the protective caps. RMA requests will be accepted and processed only if the LGA 3647 socket comes with the protective caps.



► CPU

Installing the CPU, Fan and Heat Sink

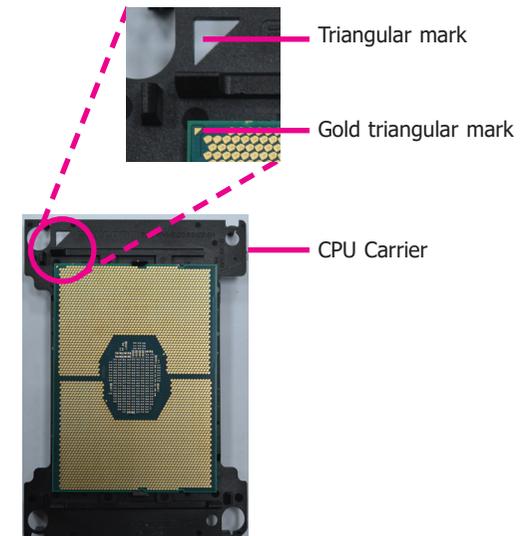
The CPU must be kept cool by using a CPU fan with heat sink. Without sufficient air circulation across the CPU and heat sink, the CPU will overheat damaging both the CPU and system board.



Note:

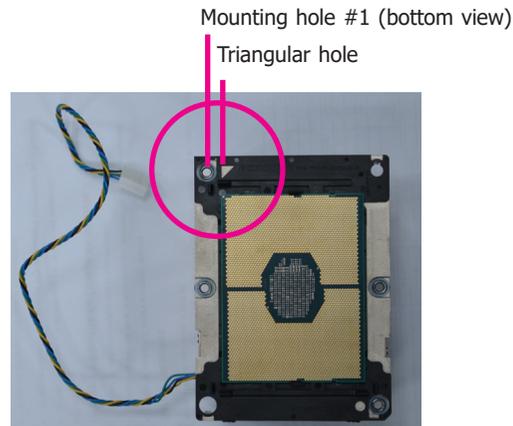
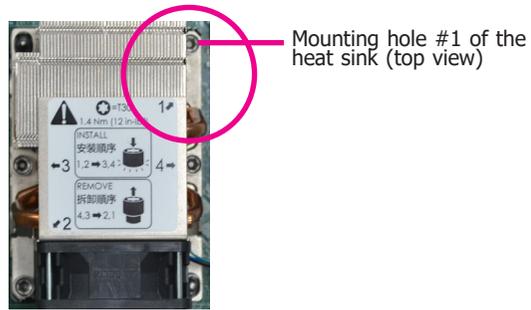
A boxed Intel® processor already includes the CPU fan and heat sink assembly. If your CPU was purchased separately, make sure to only use Intel®-certified fan and heat sink.

1. Before you place the CPU on the heat sink, you must apply a thermal paste onto the top of the heat sink. The thermal paste is usually supplied when you purchase the fan with heat sink assembly. Do not spread the paste all over the surface. When you later place the CPU on top of the heat sink, the compound will disperse evenly. Some heat sinks come with a patch of pre-applied thermal paste. Do not apply thermal paste if the fan with heat sink already has a patch of thermal paste on its underside. Peel the strip that covers the paste before you place the CPU on top of the heat sink.
2. Insert the CPU into the CPU carrier. The gold triangular mark on the CPU must align with the triangular corner of the CPU carrier shown on the photo.

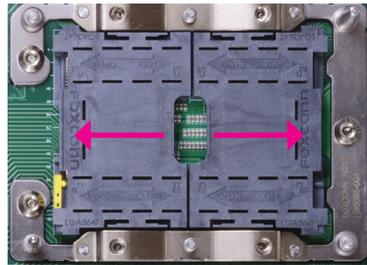


► CPU ► Installing the CPU, Fan and Heat Sink

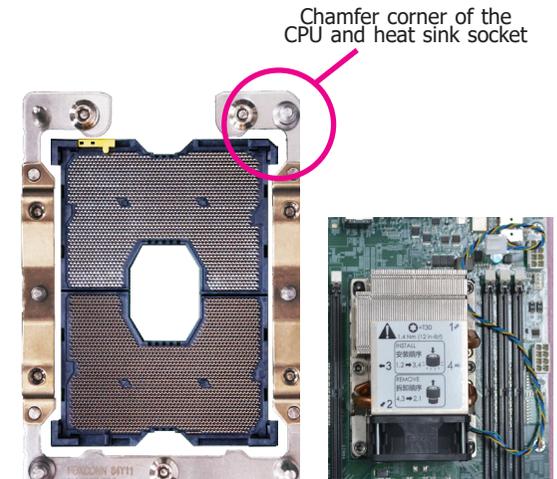
- Place the CPU carrier on top of the heat sink. Place the triangular hole near the mounting hole #1 of the heat sink. Use the push-pins around the CPU carrier to secure the CPU carrier onto the heat sink. You will hear a distinctive "click", indicating the CPU carrier is correctly locked into position.



- Slide the protective caps open and detach them from the board.



- Align the triangular mark of the CPU and CPU carrier to the chamfer corner of the CPU and heat sink socket. Place the fan / heat sink assembly on top of the socket. Use the T30 screwdriver to install the assembly according to the sequence of the screws shown on the label.

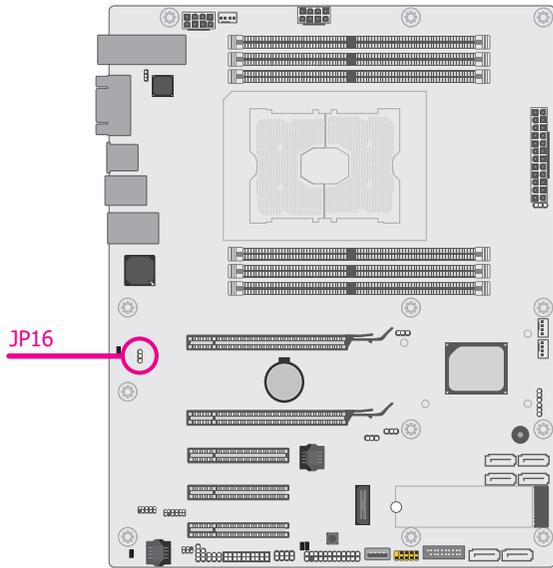


- Connect the CPU fan's power cable to the CPU fan connector on the system board.

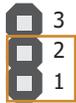


► Jumper Settings

BMC/PCH SMB Host Select



JP16 is used to select SMB host between BMC or PCH. Switch the setting by putting the jumper cap on neighboring pins as illustrated below:

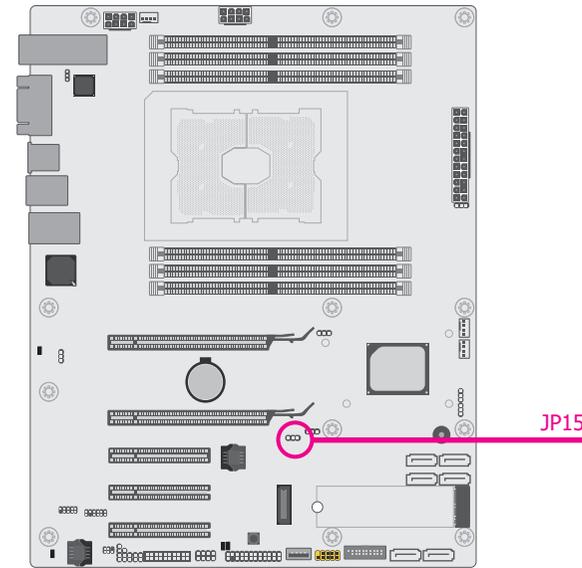


▲ 1-2 On: BMC SMB Host (default)



▲ 2-3 On: PCH SMB Host

► Jumper Settings
Clear CMOS



If any anomaly of the followings is encountered —

- a) CMOS data is corrupted;
- b) you forgot the supervisor or user password

— it is suggested that the system be reconfigured with default values stored in the ROM BIOS. To load the default values stored in the ROM BIOS, please follow the steps below.

1. Power-off the system and unplug the power cord.
2. Put a jumper cap on JP5's pin 2 and pin 3. Wait for a few seconds and set JP5 back to its default setting, i.e. jumper cap on pin 1 and pin 2.
3. Plug the power cord and power-on the system.



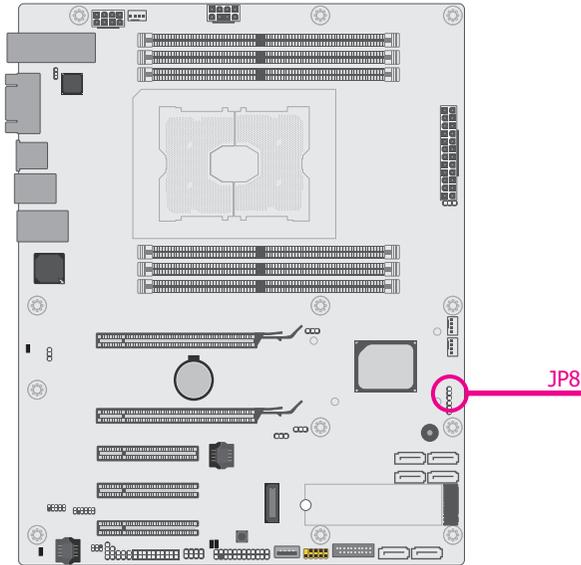
▲ 1-2 On: Normal (default)



▲ 2-3 On: Clear CMOS

► Jumper Settings

ME Firmware Update



JP8 is used to update the Management Engine (ME) firmware. Switch the setting by putting the jumper cap on neighboring pins as illustrated below:



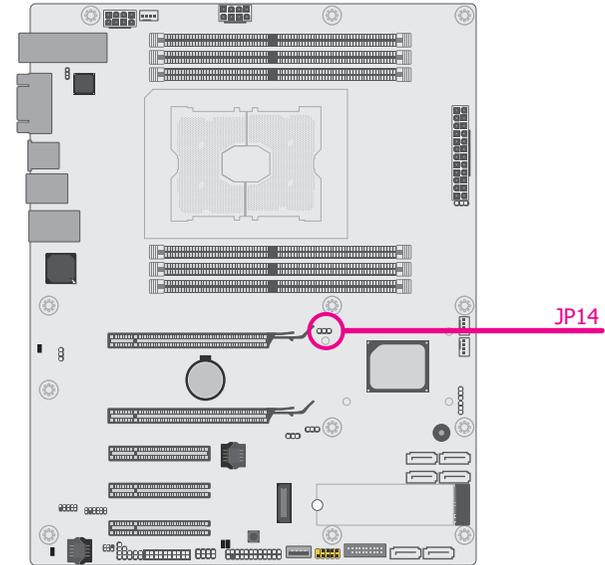
▲ 1-2 On: Disable (default)



▲ 2-3 On: ME Force Update

► Jumper Settings

PCIe 3 Switch



Two operation modes can be configured for PCIe 3. When the jumper JP14 is set to "2-3 On", half of the lanes of PCIe3 are used for on-board 10G LAN (PCH uplink), with the other half providing x4 bandwidth. When JP14 is set to "1-2 on", PCIe3 will be performing at x8 bandwidth without on-board 10G LAN.



▲ 1-2 On: PCIe x8



▲ 2-3 On: 10G LAN + PCIe x4

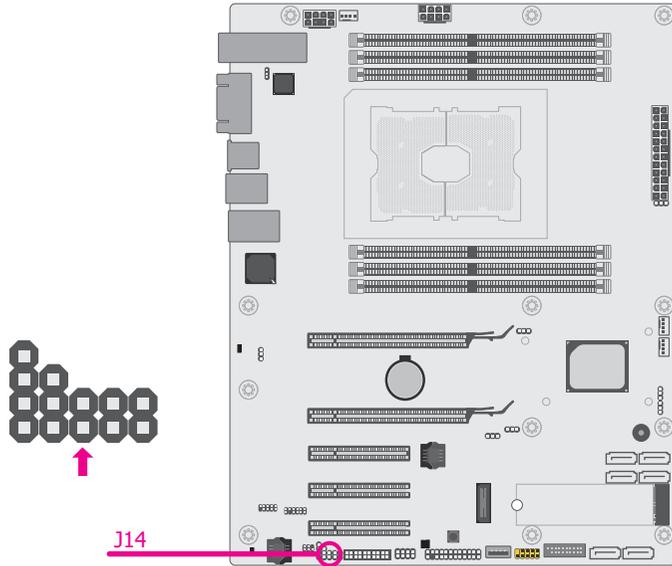


Note:

Please also refer to the BIOS settings in Chapter 3 to enable 10G LAN on PCIe3.

► Jumper Settings

Enable eSPI



J14 is used to enable eSPI or LPC mode. Put on or remove the cap as illustrated below to switch between signals:



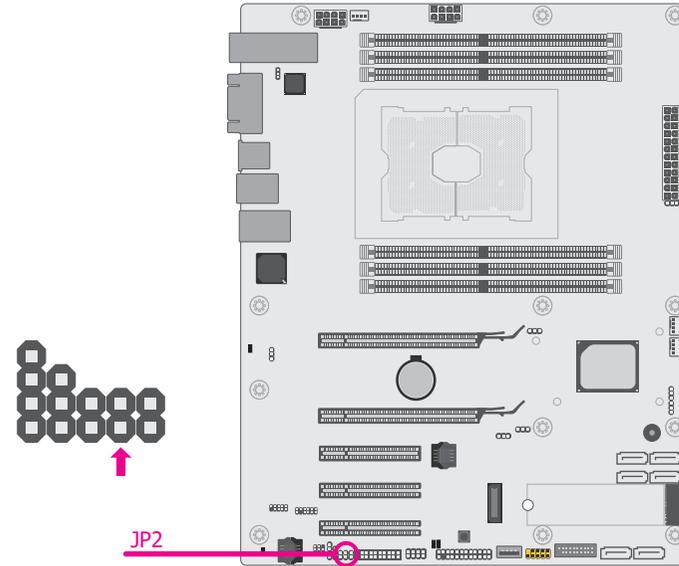
▲ No Cap: LPC Mode (default)



▲ Cap On: eSPI Mode

► Jumper Settings

UART Debug Select



JP2 is used to switch which UART is used as BMC Console Port for debugging. Put on or remove the cap as illustrated below to switch between signals:



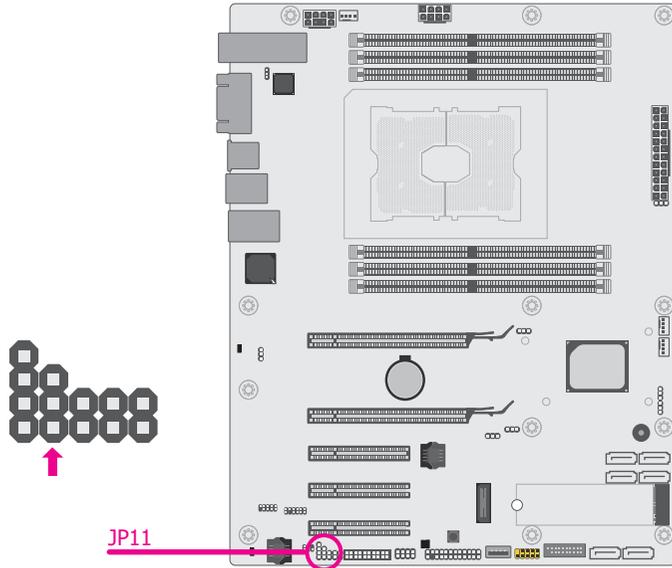
▲ No Cap: UART1 as BMC Console Port



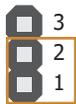
▲ Cap On: UART5 as BMC Console Port

► Jumper Settings

RSVD CPLD Update



JP11 is used to update the RSVD CPLD. Switch the setting by putting the jumper cap on neighboring pins as illustrated below:



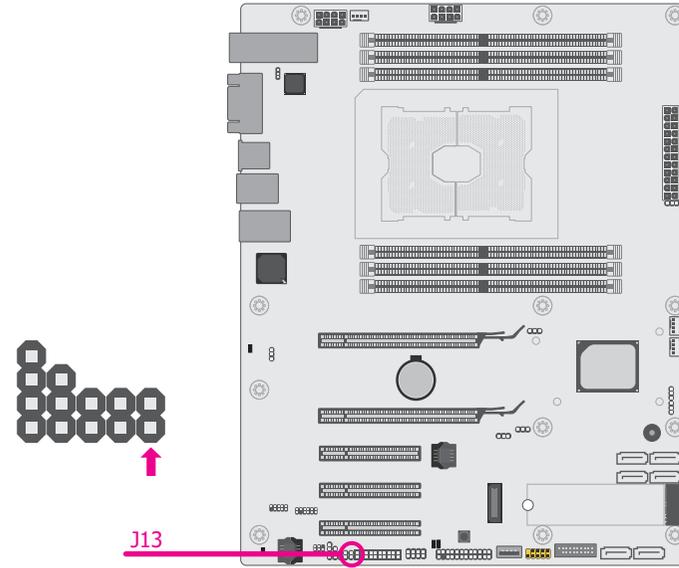
▲ 1-2 On: RSVD CPLD update



▲ 2-3 On: Normal (default)

► Jumper Settings

BMC Password Clear



J13 is used to clear the existing BMC password. Put on or remove the cap as illustrated below to switch between signals:

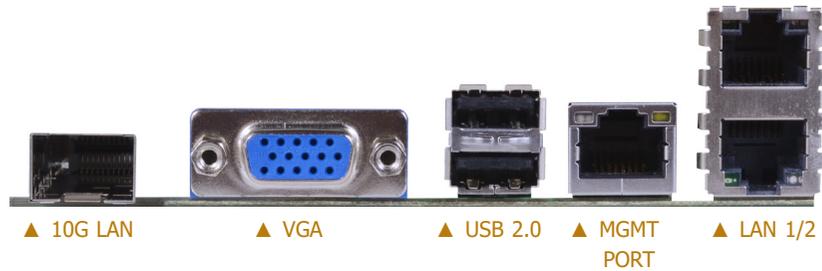


▲ No Cap: Normal (default)



▲ Cap On: Clear BMC Password

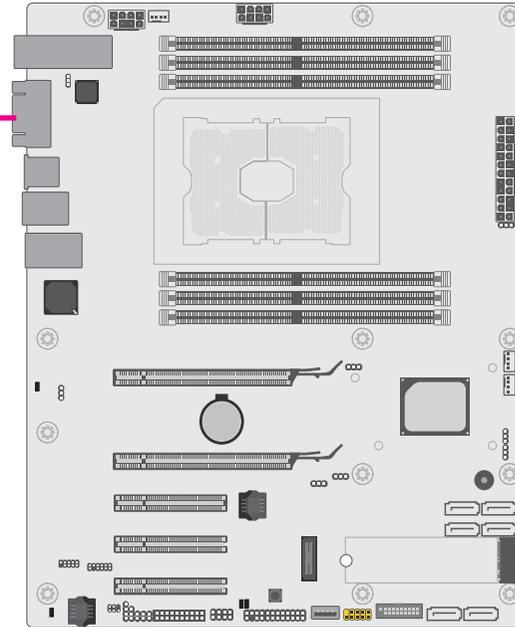
► Rear Panel I/O Ports



The rear panel I/O ports consist of the following:

- 1 x 10G LAN
- 1 x VGA port
- 2 x USB 2.0 ports
- 1 x MGMT port
- 2 x Gigabit LAN ports

► Rear Panel I/O Ports Graphics Interface



VGA Port

The VGA port is used for connecting a VGA monitor. Connect the monitor's 15-pin D-shell cable connector to the VGA port. After you plug the monitor's cable connector into the VGA port, gently tighten the cable screws to hold the connector in place.

BIOS Setting

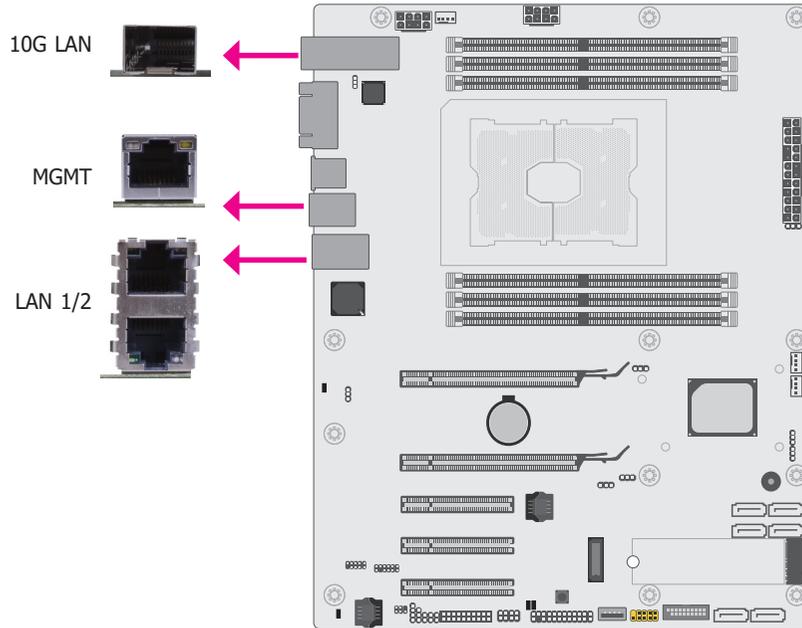
Configure the display devices in the "Advanced" menu ("Video Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

Driver Installation

Install the graphics driver. Refer to the chapter 4 for more information.

▶ Rear Panel I/O Ports

LAN Ports



Features

- LAN 1/2: i350-AM2
- 10G LAN: CS4227
- MGMT: RTL8211F

The LAN port allows the system board to connect to a local area network by means of a network hub.

BIOS Setting

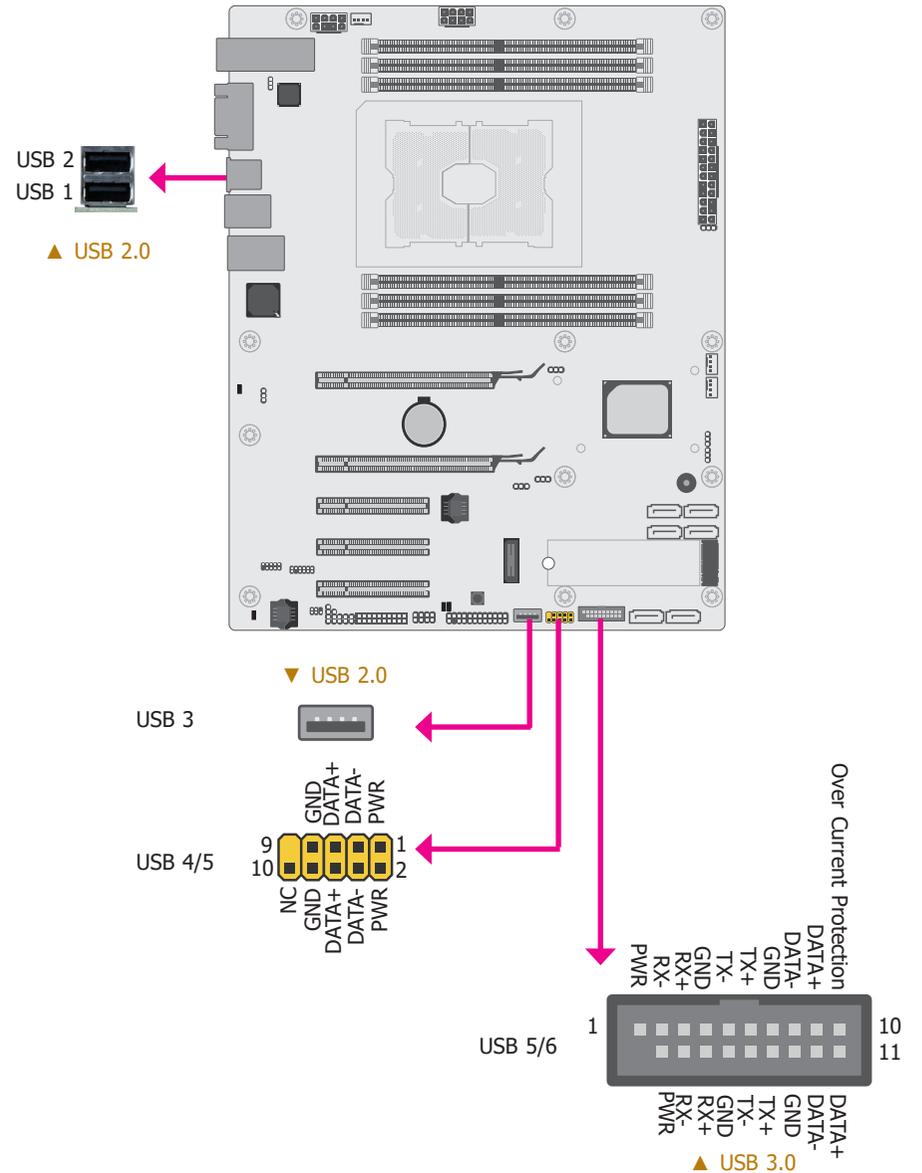
Configure the onboard LAN ports in the "Advanced" menu ("ACPI Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

Driver Installation

Install the LAN drivers. Refer to the chapter 4 for more information.

▶ Rear Panel I/O Ports

USB Ports



► Rear Panel I/O Ports ► USB Ports

The USB device allows data exchange between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

The system board is equipped with 2 onboard USB 2.0 ports (USB 1-2) and 1 vertical USB 2.0 port (USB 3). The 10-pin connector allows you to connect 2 additional USB 2.0 ports (USB 4-5). The 20-pin connector allows you to connect 2 additional USB 3.0 ports (USB 5-6). The additional USB ports may be mounted on a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis and then insert the USB port cables to a connector.

BIOS Setting

Configure these onboard USB devices in the Advanced menu ("USB Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

Wake-On-USB Keyboard/Mouse

The Wake-On-USB Keyboard/Mouse function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.

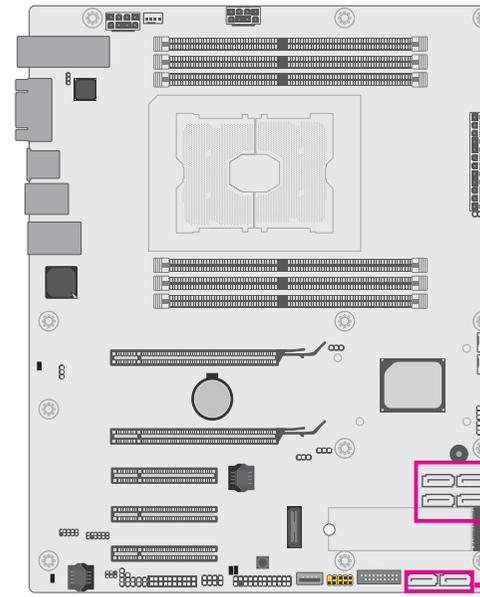


Important:

If you are using the Wake-On-USB Keyboard/Mouse function for 2 USB ports, the +5V_standby power source of your power supply must support $\geq 1.5A$. For 3 or more USB ports, the +5V_standby power source of your power supply must support $\geq 2A$.

► I/O Connectors

SATA (Serial ATA) Connectors



▼ SATA Pin Assignment



▼ SATA 1 ▼ SATA 0



▲ SATA 3 ▲ SATA 2



▲ SATA 5 ▲ SATA 4

Features

- 6 Serial ATA 3.0 ports with data transfer rate up to 6Gb/s
- Integrated Advanced Host Controller Interface (AHCI) controller
- Supports RAID 0, RAID 1, RAID 5, RAID 10

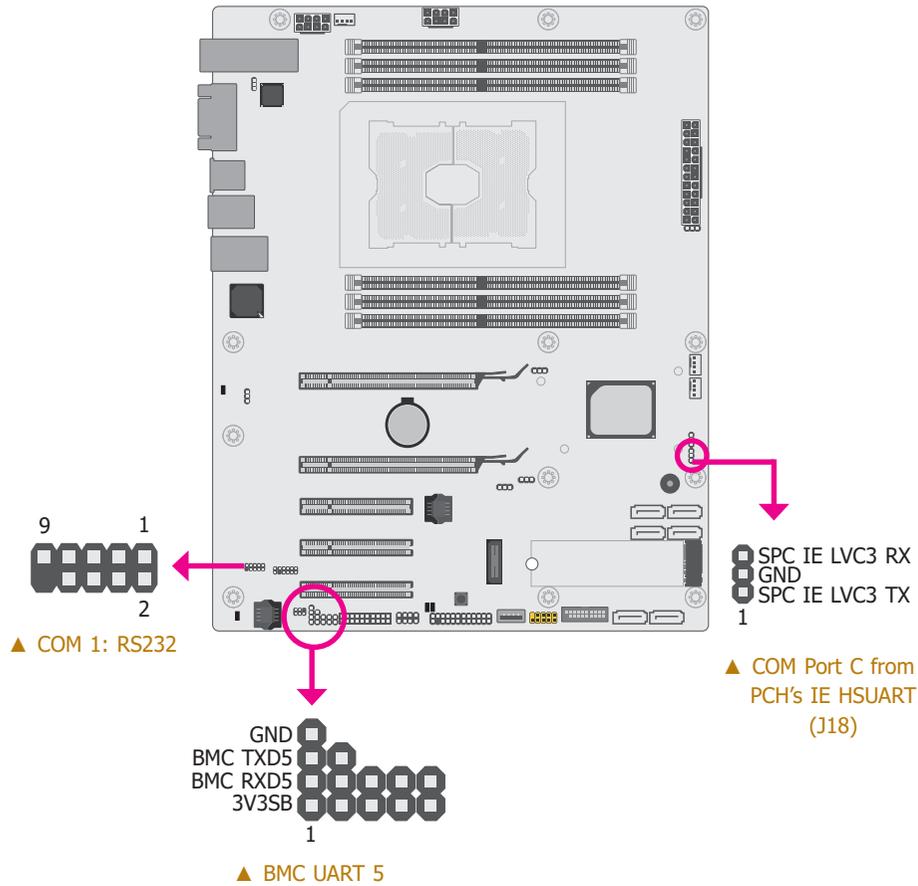
The Serial ATA connectors are used to connect Serial ATA devices. Connect one end of the Serial ATA data cable to a SATA connector and the other end to your Serial ATA device.

BIOS Setting

Configure the Serial ATA drives in the Advanced menu ("SATA Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

► I/O Connectors

COM (Serial) Ports



▼ COM 1 Pin Assignment

Pin	Assignment	Pin	Assignment
1	DCD-	2	RD
3	TD	4	DTR-
5	GND	6	DSR-
7	RTS-	8	CTS-
9	RI-	10	---

Connecting External Serial Ports

Your COM port may come mounted on a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis then insert the serial port cable to the COM connector. Make sure the colored stripe on the ribbon cable is aligned with pin 1 of the COM connector.

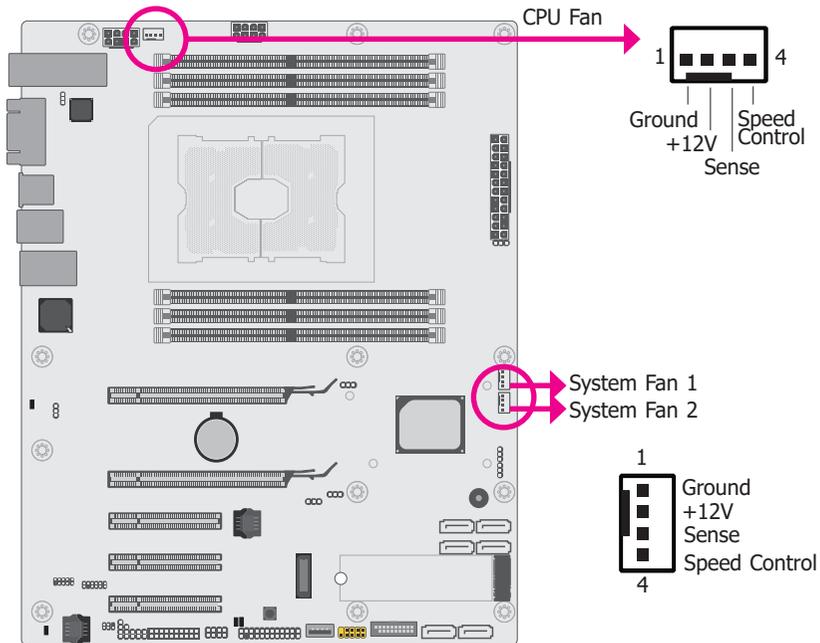
BIOS Setting

Configure the serial COM port in the "Advanced" menu ("SIO AST2500" submenu) of the BIOS. Refer to the chapter 3 for more information.

COM 1 is fixed at RS232. Please refer to the pin assignment listed below. The serial port is asynchronous communication ports with 16C550A-compatible UARTs that can be used with modems, serial printers, remote display terminals, and other serial devices.

I/O Connectors

Cooling Fan Connectors



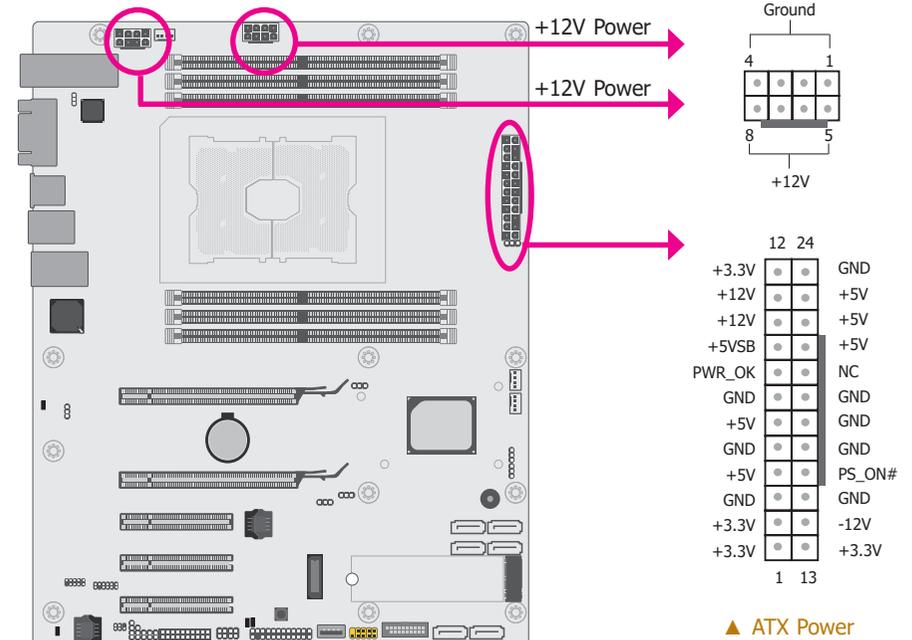
These fan connectors are used to connect cooling fans. The cooling fans will provide adequate airflow throughout the chassis to prevent overheating the CPU and system board components.

BIOS Setting

Information of the Cooling fans is displayed in the "Advanced" menu ("SDR List" submenu under the "H2O IPMI Configuration" submenu) of the BIOS. Please refer to chapter 3 for more information.

I/O Connectors

Power Connectors



Use a power supply that complies with the ATX12V Power Supply Design Guide Version 1.1. An ATX12V power supply unit has a standard 24-pin ATX main power connector that must be inserted into the 24-pin connector. The 8-pin +12V power connector enables the delivery of more +12VDC current to the processor's Voltage Regulator Module (VRM).

The power connectors from the power supply unit are designed to fit the 24-pin and 8-pin connectors in only one orientation. Make sure to find the proper orientation before plugging the connectors.

The system board requires a minimum of 300 Watt power supply to operate. Your system configuration (CPU power, amount of memory, add-in cards, peripherals, etc.) may exceed the minimum power requirement. To ensure that adequate power is provided, we strongly recommend that you use a minimum of 400 Watt (or greater) power supply.

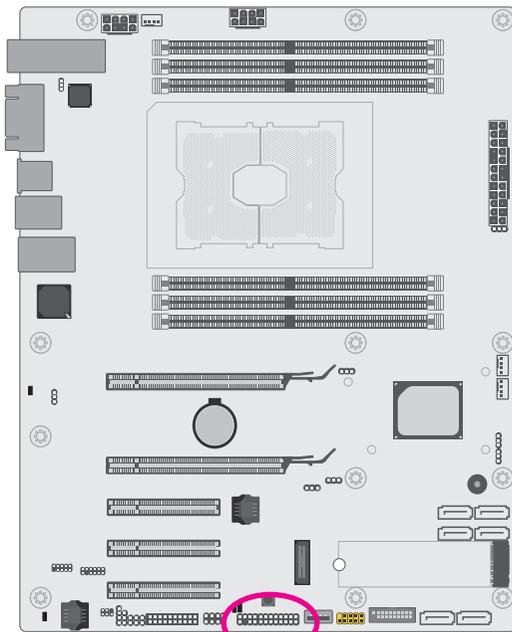


Important:

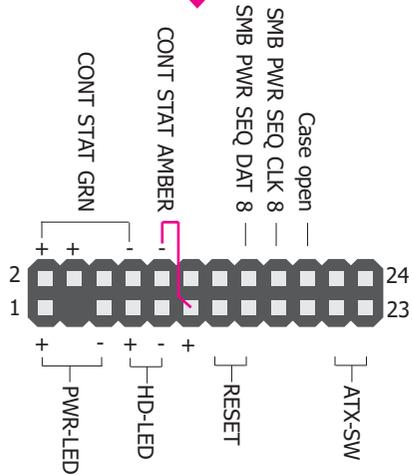
Insufficient power supplied to the system may result in instability or the add-in boards and peripherals not functioning properly. Calculating the system's approximate power usage is important to ensure that the power supply meets the system's consumption requirements.

► I/O Connectors

Front Panel Connector



Front Panel



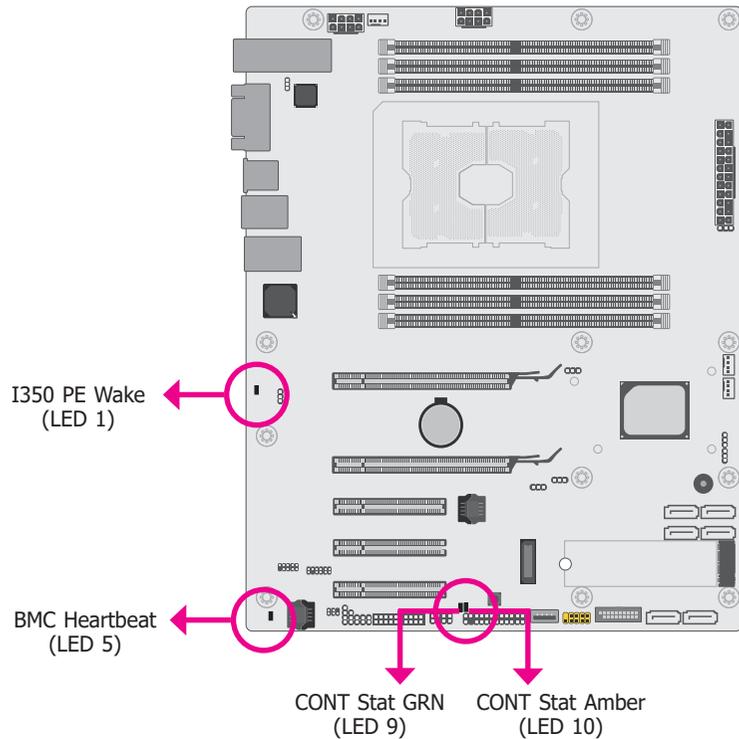
▼ Front Panel Pin Assignment

	Pin	Assignment
PWR-LED	1	LED Power
	5	Signal
HD-LED	7	HD Power
	9	Signal
CONT STAT AMBER	10	Signal
	11	Power
RESET	13	GND
	15	RST Signal
	17	GND
	19	NC
ATX-SW	21	GND
	23	Signal

	Pin	Assignment
CONT STAT GRN	2	Power
	8	Signal
	4	Power
	6	NC
	12	NC
	14	NC
	16	SMB PWR SEQ DAT 8
	18	SMB PWR SEQ CLK 8
	20	Case open
	22	NC
	24	NC
	3	---

I/O Connectors

LEDs

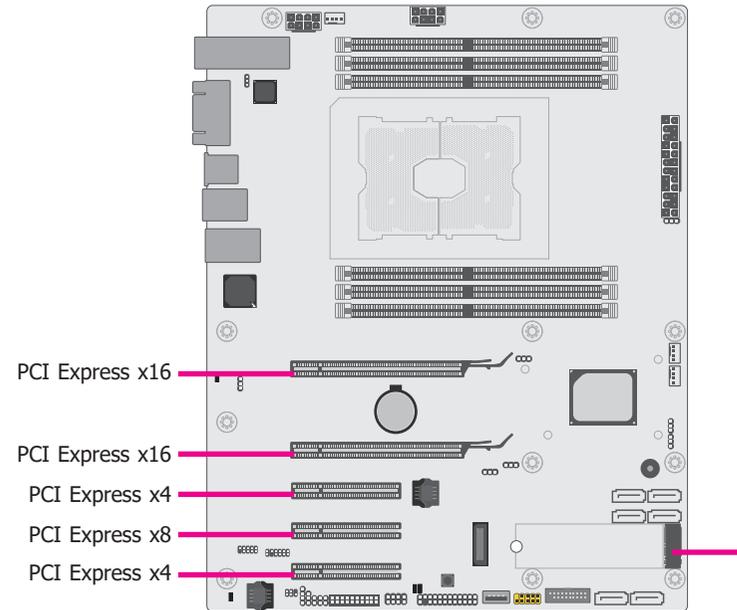


CONT Stat GRN LED indicates that status is good. CONT Stat Amber LED indicates that status is bad. BMC Heartbeat LED indicates whether the BMC SPI flash is programmed. The hardware mode includes below blinking modes:

0Hz	Always dark, meaning firmware is not running or invalid
0.1Hz	Abnormal mode, some interrupts are not serviced for over 2 seconds.
0.5Hz	Normal operation mode, ARM running on DRAM with interrupt monitor enabled
2Hz	ARM running on DRAM without interrupt enabled (instruction fetch from DRAM)
10Hz	ARM running on Flash (instruction fetch from flash)

I/O Connectors

Expansion Slots



PCIe 1 & 2: PCI Express x16

Install PCI Express x16 graphics card, that comply to the PCI Express specifications, into the PCI Express x16 slot. To install a graphics card into the x16 slot, align the graphics card above the slot then press it down firmly until it is completely seated in the slot. The retaining clip of the slot will automatically hold the graphics card in place.

PCIe 3 & 5: PCI Express x4 (x8 connector)

Install PCI Express cards such as network cards or other cards that comply to the PCI Express specifications into the PCI Express x4 slot.

PCIe 4: PCI Express x8 Slot

Install PCI Express cards such as network cards or other cards that comply to the PCI Express specifications into the PCI Express x8 slot.

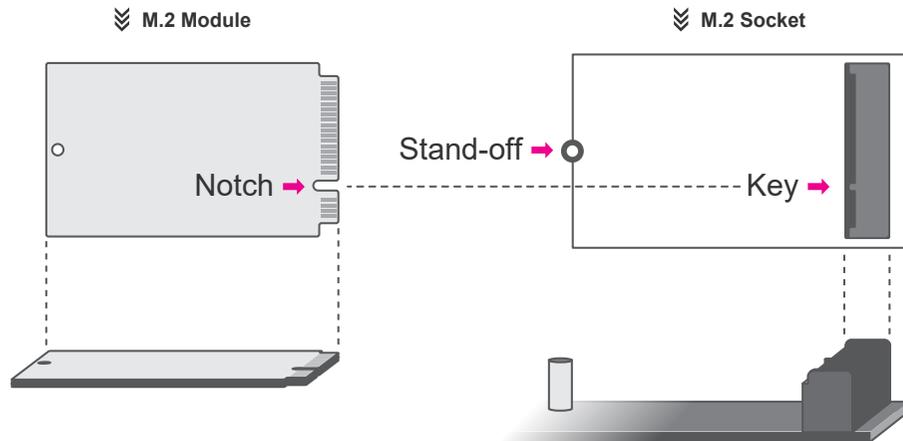
M.2 M Key Socket

The M.2 socket is the Next Generation Form Factor (NGFF) which is designed to support multiple modules and make the M.2 more suitable in application for solid-state storage. The on-board socket is reserved for a 22mm-by-80mm M key module with a standoff.

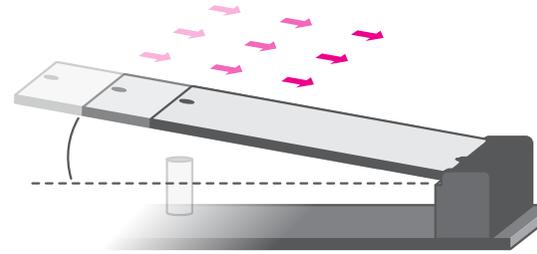
Installing the M.2 Module

Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

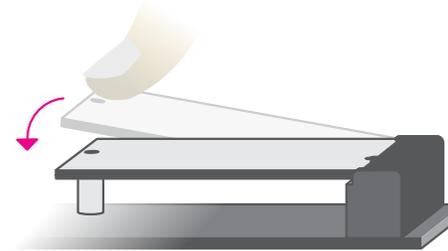
1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the M.2 socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.
5. Make sure the standoff screw is removed from the standoff.



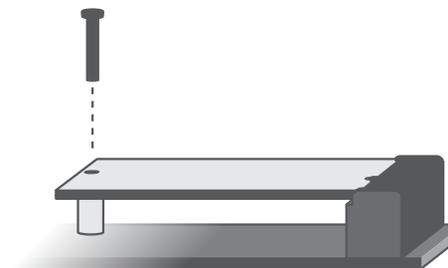
Please follow the steps below to install the card into the socket.



Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.



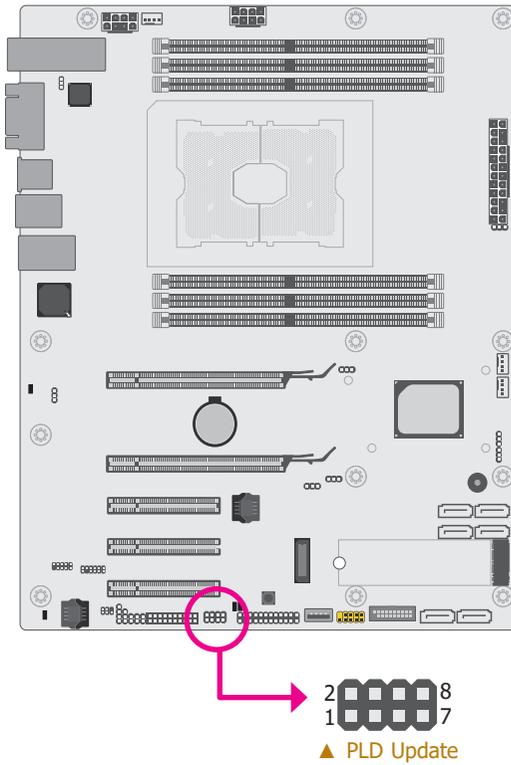
Step 2:
Press the end of the card far from the socket down until against the stand-off.



Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.

► I/O Connectors

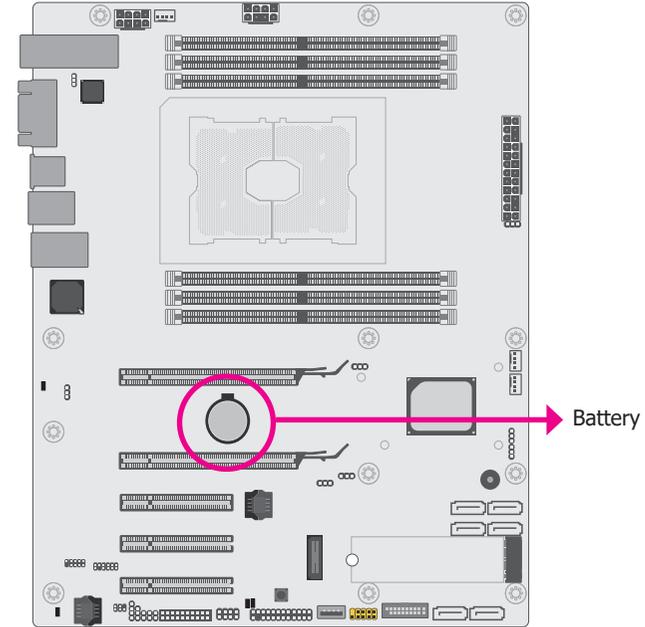
PLD Update Connector



Pin	Assignment	Pin	Assignment
1	3V3SB	2	JTAG PLD TDO
3	JTAG PLD TDI	4	JTAG PLD EN N
5	JTAG PLD RST N	6	JTAG PLD TMS
7	GND	8	JTAG PLD TCK

► I/O Connectors

Battery



The lithium ion battery powers the real-time clock and CMOS memory. It serves as an auxiliary source of power when the main power source is lost.

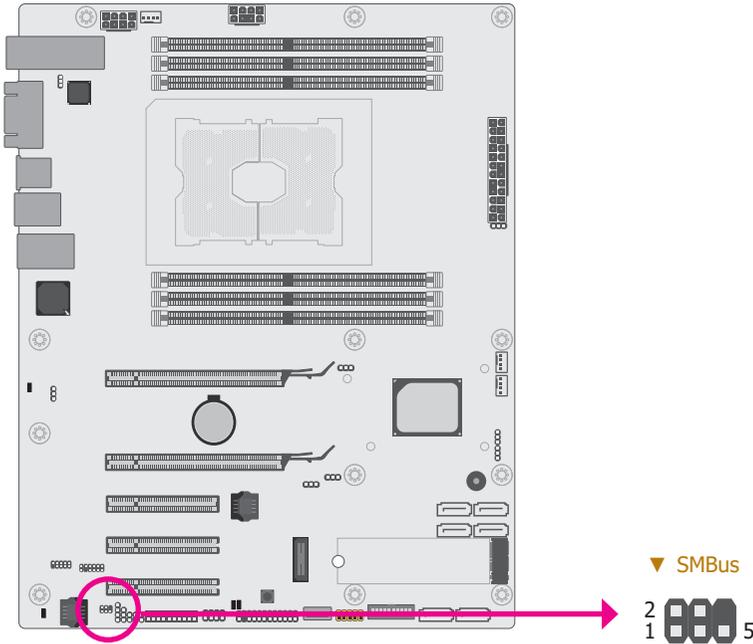
To install or remove the battery into or from the vertical slot, please bend the protective cap away before inserting or removing the battery.

Safety Measures

- There exists explosion hazard if the battery is incorrectly installed.
- Replace only with the same or equivalent type recommended by the manufacturer.
- Dispose of used batteries according to local ordinances.

► I/O Connectors

SMBus Connector

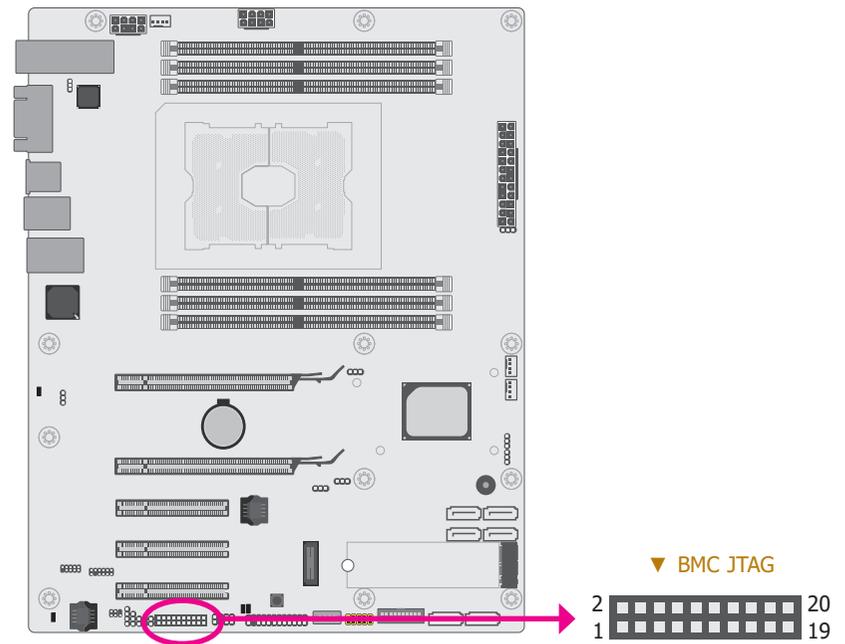


The SMBus (System Management Bus) connector is used to connect SMBus devices. It is a multiple device bus that allows multiple chips to connect to the same bus and enable each one to act as a master by initiating data transfer.

Pin	Assignment	Pin	Assignment
1	3V3 AUX	2	GND
3	SMB HOST STBY LVC3 SCL	4	SMB HOST STBY LVC3 SDA
5	PU PCH TLS ENABLE STRAP	6	---

► I/O Connectors

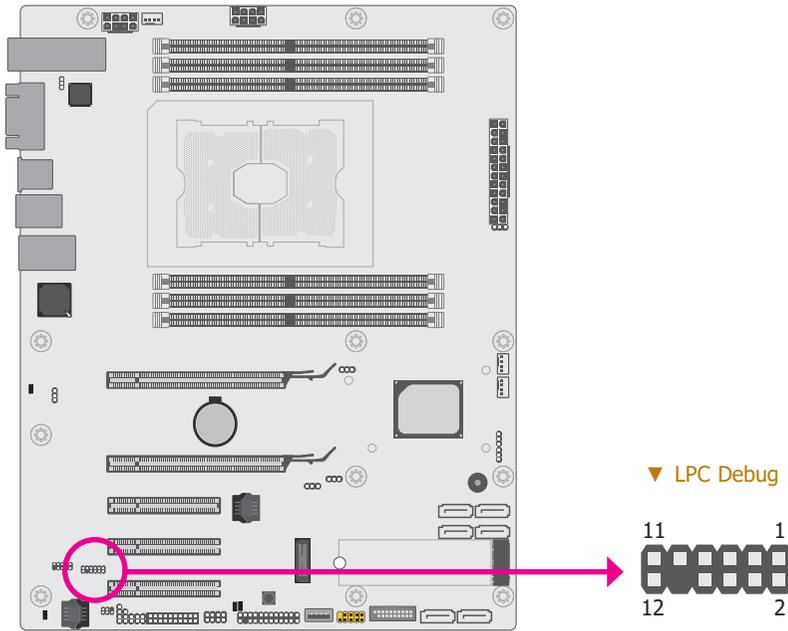
BMC JTAG Female Header



Pin	Assignment	Pin	Assignment
1	3V3SB	2	3V3SB
3	JTAG BMC NTRST	4	GND
5	JTAG BMC TDI	6	GND
7	JTAG BMC TMS	8	GND
9	JTAG BMC TCK	10	GND
11	JTAG BMC RTCK	12	GND
13	JTAG BMC TDO	14	GND
15	MISC IBMC SRST N	16	GND
17	GND	18	GND
19	GND	20	GND

► I/O Connectors

LPC Debug Connector

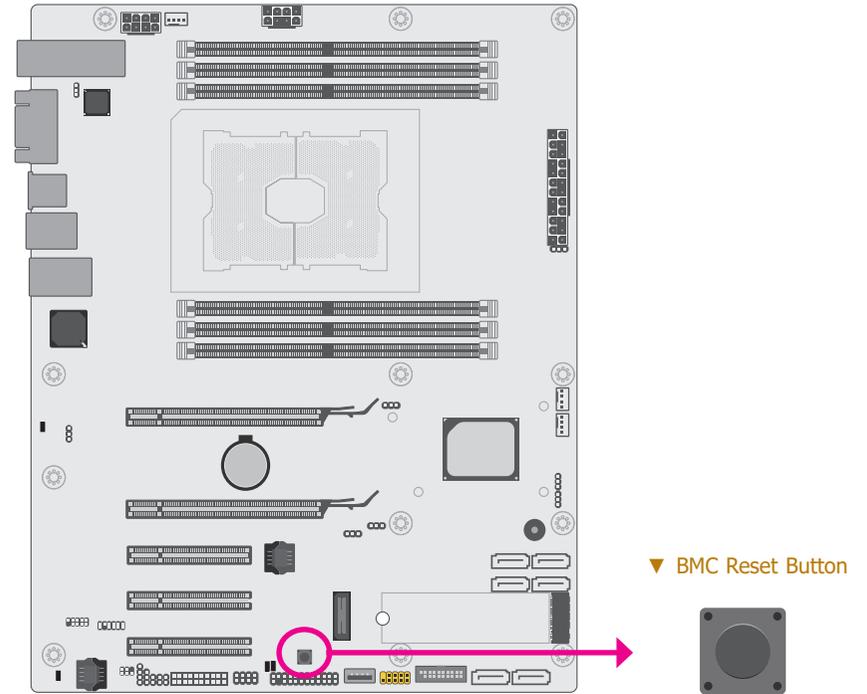


The Low Pin Count Interface was defined by Intel® Corporation to facilitate the industry's transition towards legacy free systems. It allows the integration of low-bandwidth legacy I/O components within the system, which are typically provided by a Super I/O controller. Furthermore, it can be used to interface firmware hubs, Trusted Platform Module (TPM) devices and embedded controller solutions. Data transfer on the LPC bus is implemented over a 4 bit serialized data interface, which uses a 33MHz LPC bus clock. For more information about LPC bus refer to the Intel® Low Pin Count Interface Specification Revision 1.1'. The table below indicates the pin functions of the LPC connector.

Pin	Assignment	Pin	Assignment
1	CLK	2	LAD1
3	RST#	4	LAD0
5	FRAME#	6	3V3
7	LAD3	8	GND
9	LAD2	10	---
11	SERIRQ	12	48MHz

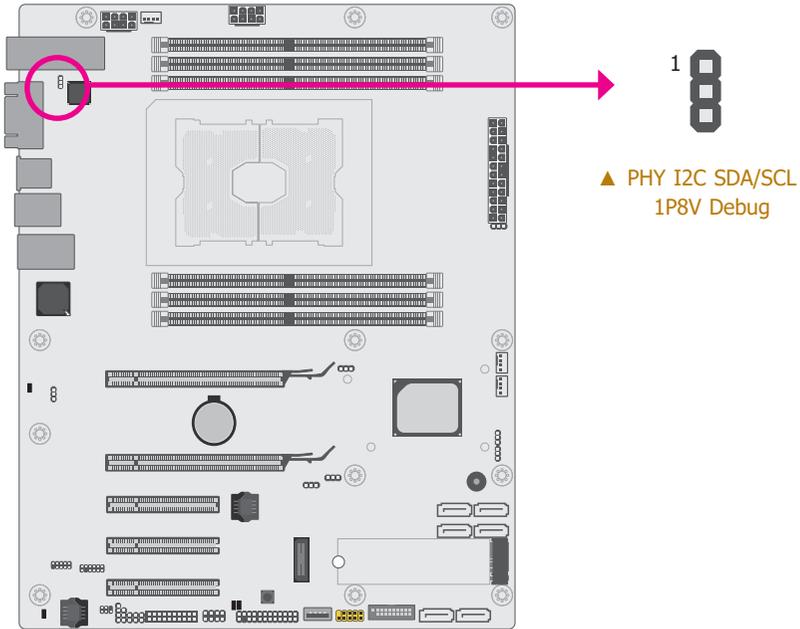
► I/O Connectors

Switch



► I/O Connectors

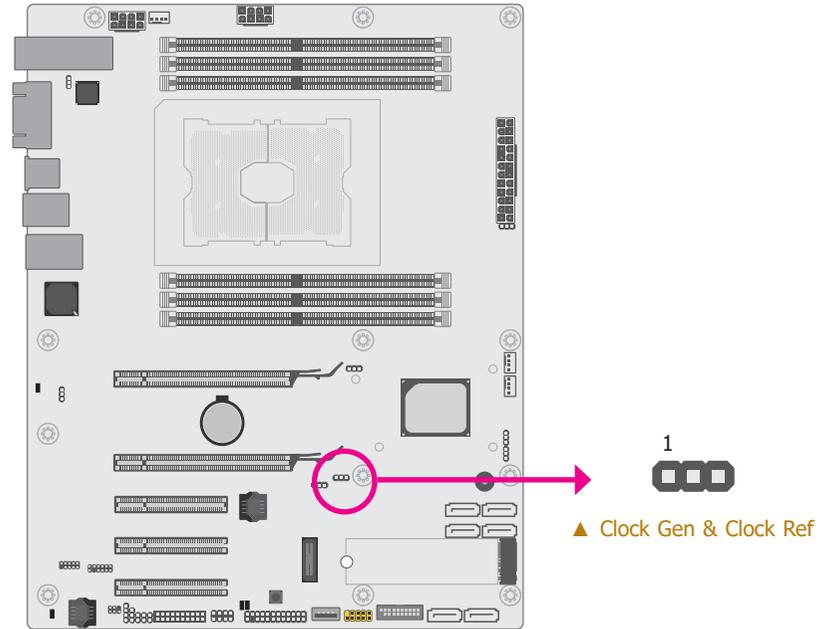
PHY I2C SDA/SCL 1P8V Debug Connector



Pin	Assignment
1	SFFP0 EEPROM I2C SCL
2	GND
3	SFFP0 EEPROM I2C SDA

► I/O Connectors

Clock Gen Clock Ref Connector



Pin	Assignment
1	CLK 100M PE CLKREF P
2	GND
3	CLK 100M PE CLKREF N

Chapter 3 - BIOS Setup

► Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added.

It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.



Note:

The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

Default Configuration

Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

Entering the BIOS Setup Utility

The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen.

The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message "Press DEL to run setup" will appear on the screen. If the message disappears before you respond, restart the system or press the "Reset" button. You may also restart the system by pressing the <Ctrl> <Alt> and keys simultaneously.

Legends

Key	Function
Right and Left arrows	Moves the highlight left or right to select a menu.
Up and Down arrows	Moves the highlight up or down between submenu or fields.
<Esc>	Exit to the BIOS Setup Utility.
<F1>	Help
<F5>	Previous option
<F6>	Next option
<F9>	Setup Defaults
<F10>	Save and Exit
<Enter>	Press <Enter> to enter the highlighted sub-menu, or display all the options for the field in a pop-up list .

Scroll Bar

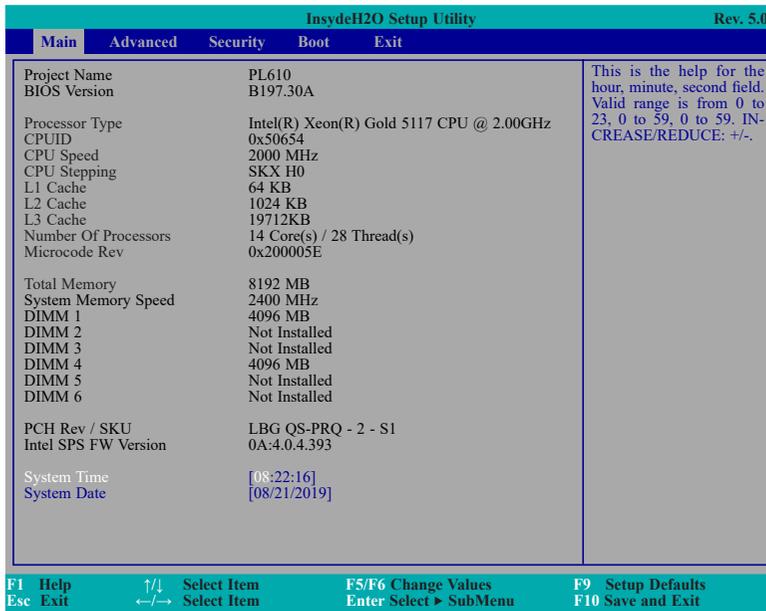
When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

Submenu

When "►" appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.

► Main

The Main menu is the first screen that shows up after entering the BIOS Setup Utility.



System Time

The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

System Date

The date format is <month>, <date>, <year>. Month displays the month, from 01 to 12. Date displays the date, from 01 to 31. Year displays the year, from 2000 to 2099.

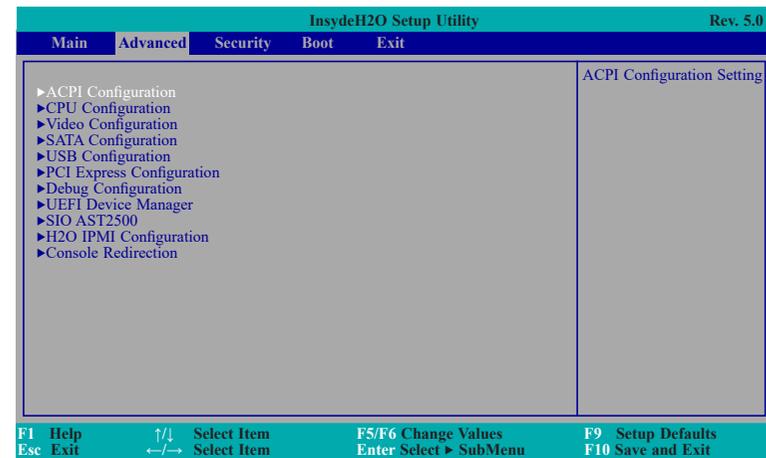
► Advanced

The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.



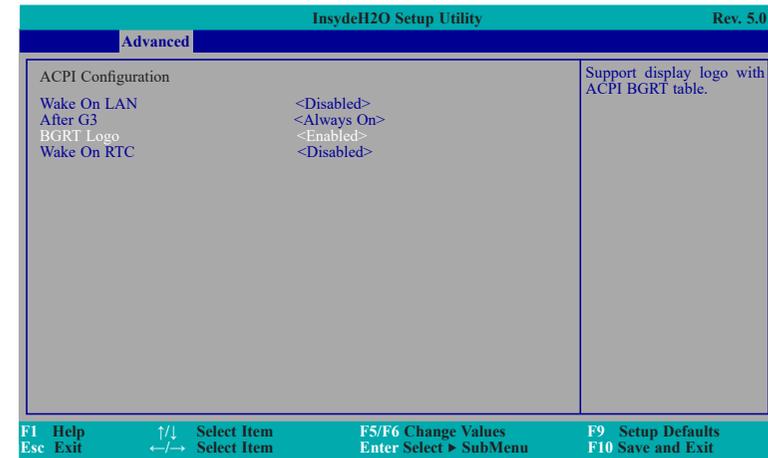
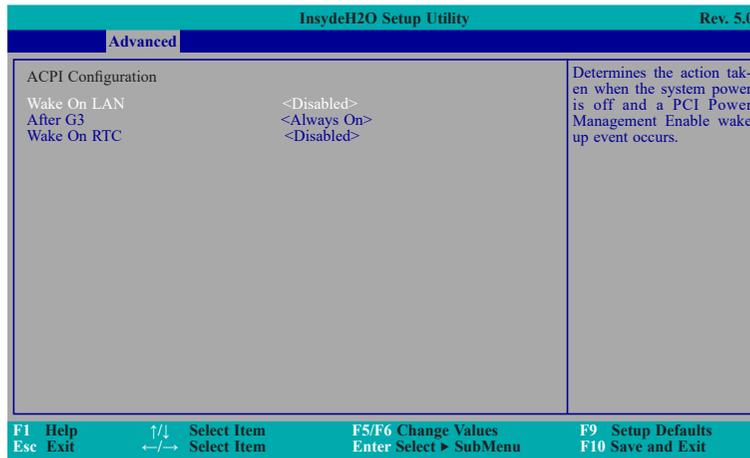
Important:

Setting incorrect field values may cause the system to malfunction.



► Advanced

ACPI Configuration

**Wake On LAN**

Enable or Disable this field to allow LAN signal to power up the system.

After G3

This field is to specify what state to go when power is re-applied after a power failure (G3 state).

Always On The system working state.

Always Off Off, except for trickle current to devices such as the power button.

Wake On RTC

Automatically power the system on at a particular time every day from the Real-time clock battery.

Wake up time

When Wake On RTC is set to enabled, specify the wake up time of the day: <hour> (00~23), <minute> (00~59), <second> (00~59).

BGRT Logo

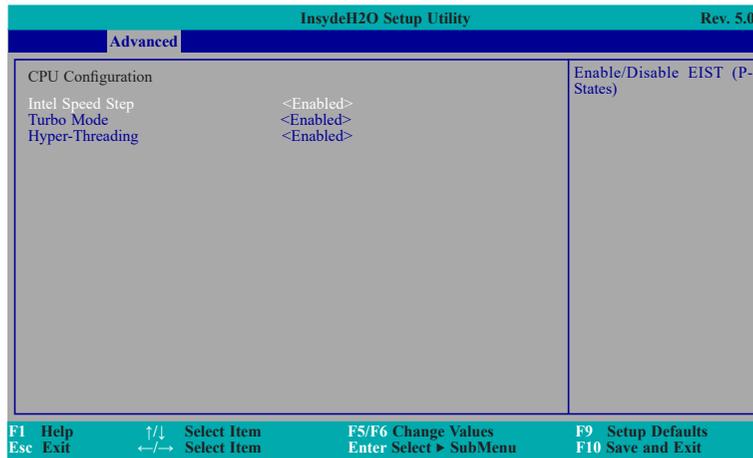
This field is used to enable or disable to support display logo with ACPI BGRT table.

**Note:**

To configure "BGRT Logo", please enable "Quiet Boot" in Boot menu. Refer to the Boot menu section in this chapter for more information.

► Advanced

CPU Configuration

**Intel Speed Step**

Enable or disable the Enhanced Intel SpeedStep technology.

Turbo Mode

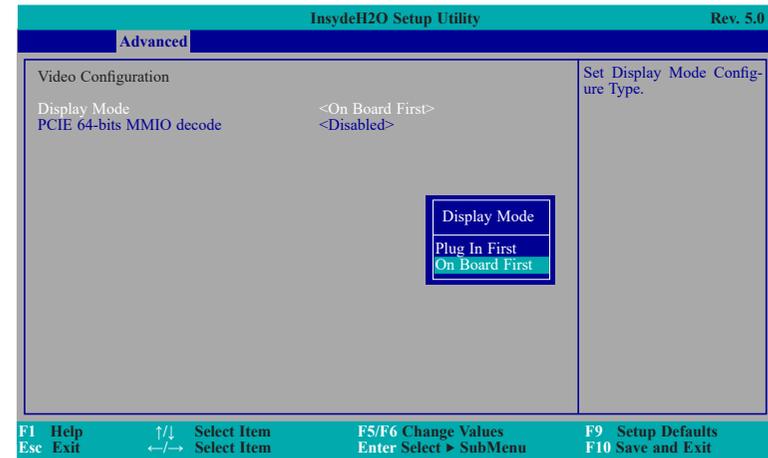
Enable or disable the turbo mode.

Hyper-Threading

Enable or disable Hyper-threading. When it is enabled, a physical core will perform as two logical processors, and the user may experience better computational efficiency of the system. Please make sure that the OS operating on your system is optimized for Hyper-Threading, e.g. Windows and Linux.

► Advanced

Video Configuration

**Display Mode**

Select the display mode between Plug In First or On Board First.

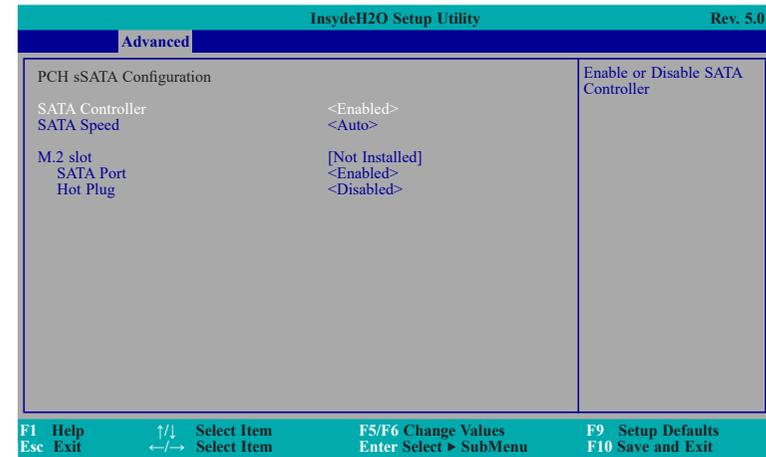
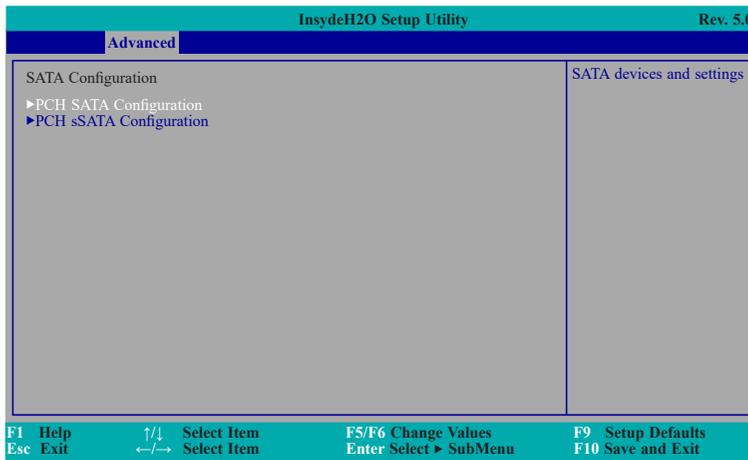
PCIE 64-bits MMIO decode

Enable or disable PCIE 64-bits memory-mapped input/output (MMIO) decode.

► Advanced

SATA Configuration

Select the SATA controller and the type of hard disk drive installed in your system.

**SATA Controller**

This field is used to enable or disable Serial ATA device(s).

SATA Speed

This field is used to select SATA speed generation limit: Auto, Gen1, Gen2 or Gen3.

Configure SATA as

Select the operation mode of SATA controller(s). Operation mode is only configurable for SATA port 0 to 5 and not for sSATA controller(s).

AHCI This option allows the Serial ATA devices to use AHCI (Advanced Host Controller Interface).

RAID This option allows you to create RAID or Intel Matrix Storage configuration on Serial ATA devices.

For each SATA port, configure the following fields:

SATA Port

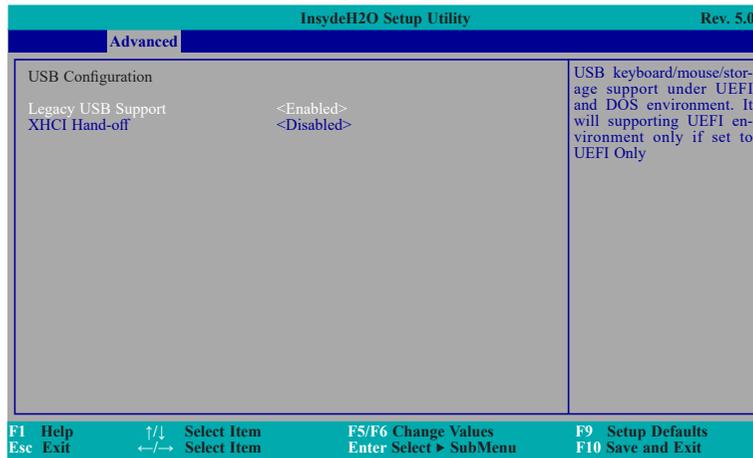
Enable or disable the SATA port.

Hot Plug

Enable or disable the Hot-pluggable function of the SATA port.

► Advanced

USB Configuration

**Legacy USB Support**

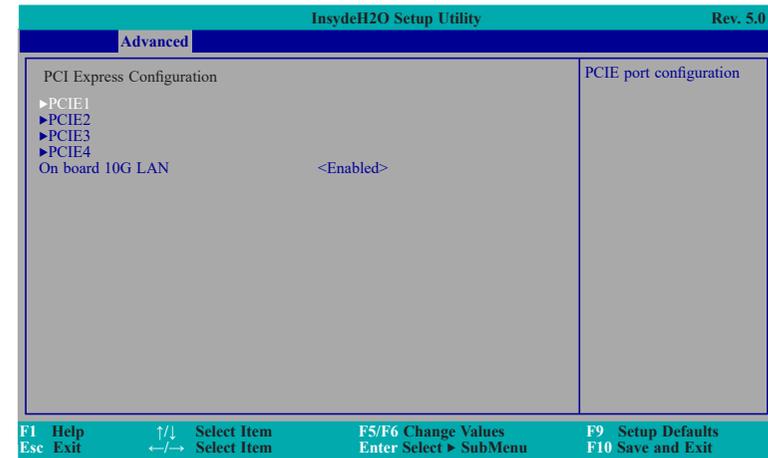
- Disabled** Disable USB keyboard/mouse/storage support under UEFI and DOS environment.
- Enabled** Enable USB keyboard/mouse/storage support under UEFI and DOS environment.
- UEFI Only** Enable USB keyboard/mouse/storage support under UEFI environment.

XHCI Hand-off

Enable or disable to clear XHCI controller ownership change SMI bit by BIOS.

► Advanced

PCI Express Configuration

**► PCIE1/2/3/4**

These sub-menus configure the PCIe ports respectively as instructed on the following page.

On board 10G LAN

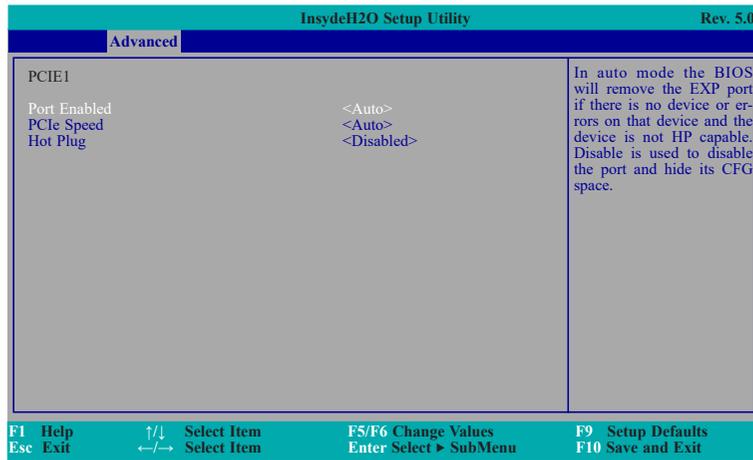
Enable or disable on-board 10G LAN on the PCIe3 Slot. When this field is set to "enabled" and the jumper JP14 is set to "2-3 On", half of the lanes of PCIe3 are used for on-board 10G LAN (PCH uplink), with the other half providing x4 bandwidth. When this field is set to "disabled" and JP14 is set to "1-2 on", PCIe3 will be performing at x8 bandwidth without on-board 10G LAN.

**Note:**

Please refer to Chapter 2 to set up Jumper settings.

► **Advanced** ► **PCI Express Configuration**

For each PCIe port, configure the following fields:



Port Enabled

This field is used to enable or disable the PCI Express Root Port.

PCIe Speed

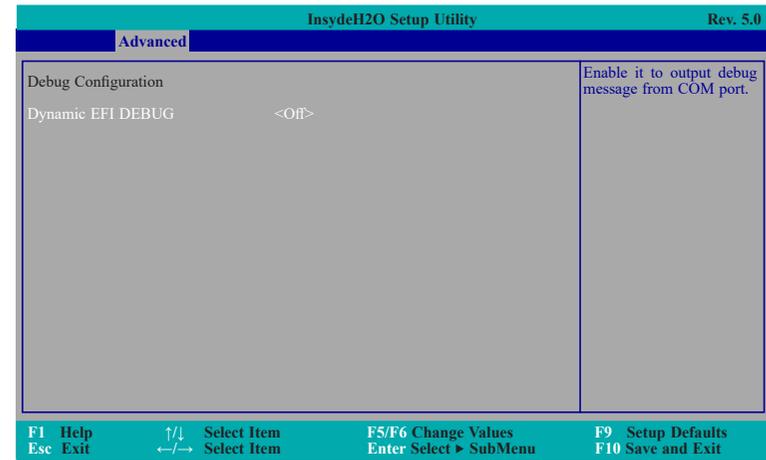
Select the speed of the PCI Express Root Port: Auto, Gen1 (2.5 GT/s), Gen2 (5 GT/s) or Gen3 (8 GT/s).

Hot Plug

This field is used to enable or disable the PCI Express Hot Plug.

► **Advanced**

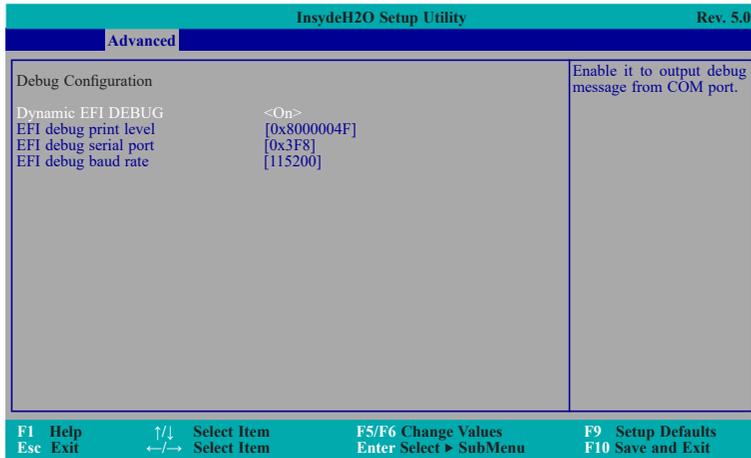
Debug Configuration



Dynamic EFI DEBUG

This field is used to turn on or off the function to output debug message from COM port. If set to on, relevant EFI debug configurations will show up.

► **Advanced** ► **Debug Configuration**



EFI debug print level

Enter the numeric value for EFI debug print level. The default is 0x8000004F.

EFI debug serial port

Enter the serial port to output EFI debug message. The default is 0x3F8.

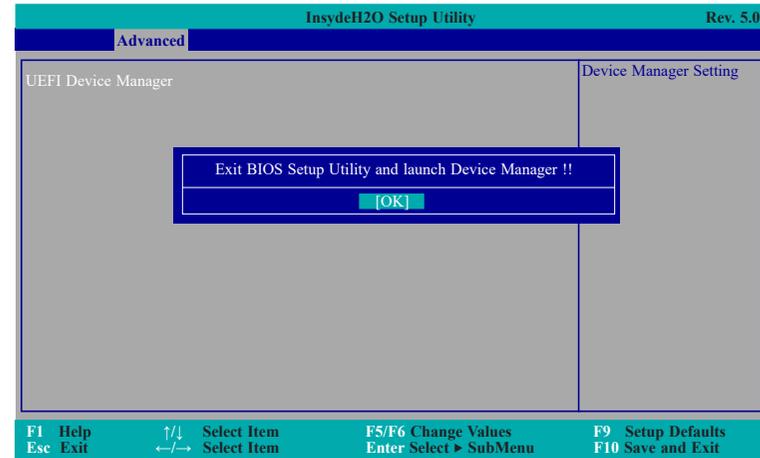
EFI debug baud rate

Enter the baud rate to output EFI debug message. The default is 115200.

► **Advanced**

UEFI Device Manager

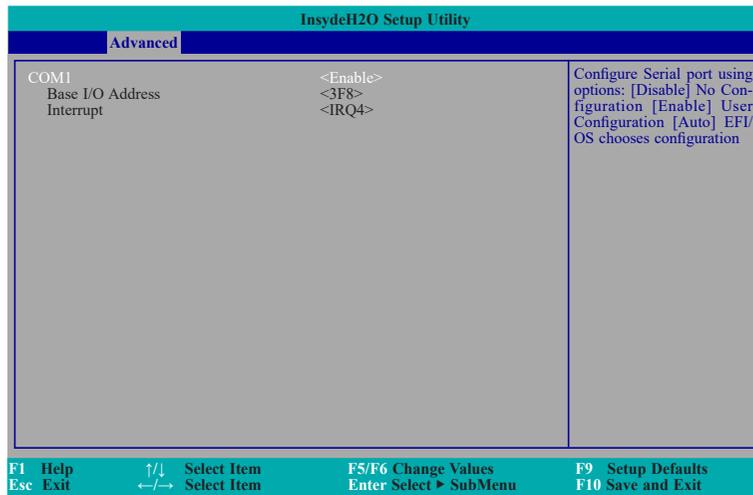
The section configures device with option ROM, such as LAN card, etc.



► Advanced

SIO AST2500

This section configures the system super I/O chip parameters.

**COM1**

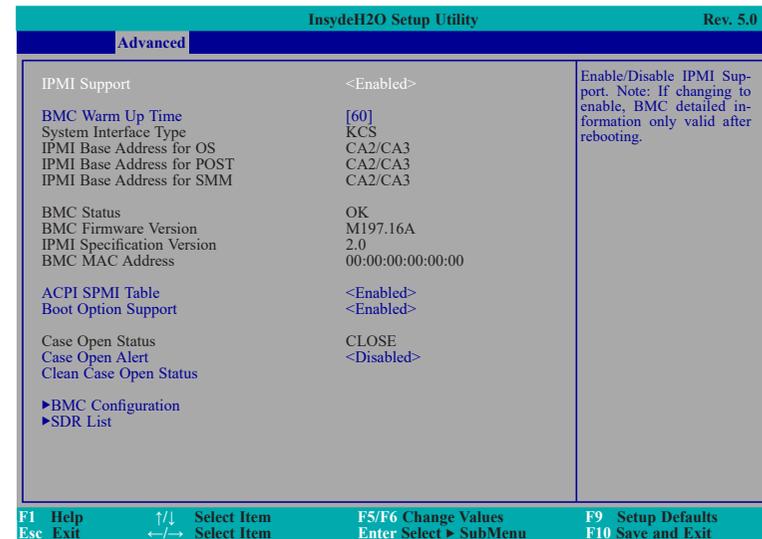
Configure the settings of the serial port.

- Disable** No configuration
- Enable** User configuration

► Advanced

H2O IPMI Configuration

This section configures the H2O IPMI (Intelligent Platform Management Interface).

**IPMI Support**

Enable or disable IPMI Support.

BMC Warm Up Time

Set the max. waiting time period from POST to BMC ready in seconds.

ACPI SPMI Table

Enable or disable the ACPI SPMI Table for IPMI driver installation.

Boot Option Support

Enable or disable IPMI boot option function.

Case Open Alert

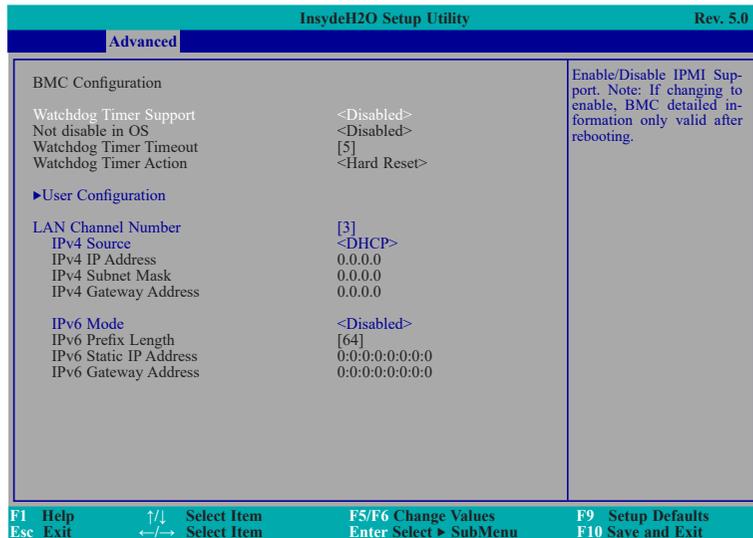
Enable or disable buzzer beep when case is open. When disabled, system will clean case open status.

Clean Case Open Status

Select this field and press Enter, system will clean the case open status.

► **Advanced** ► **H2O IPMI Configuration**

► **BMC Configuration**



Watchdog Timer Support

Enable or disable BMC watchdog timer at start of POST. When enabled, the following fields will appear.

Not disable in OS

Enable or disable BMC watchdog when boot to OS.

Watchdog Timer Timeout

Enter the number of minutes the system firmware has to boot the OS before it takes the timeout action. Valid values are from 2 to 8 minutes.

Watchdog Timer Action

Select timeout action: No Action, Hard Reset, Power Down, or Power Cycle.

Configure the LAN related settings:

LAN Channel Number

Enter the LAN channel number for BMC. The valid LAN channel number is 1, 2, or 3.

IPv4 Source

Select how BMC IPv4 settings are configured: automatically (DHCP) or manually (Static).

IPv4 IP Address

Enter the BMC IPv4 IP address.

IPv4 Subnet Mask

Enter the BMC IPv4 Subnet Mask.

IPv4 Gateway Address

Enter the BMC IPv4 Gateway Address.

IPv6 Mode

Enable or disable Internet Protocol v6 (IPv6).

IPv6 Prefix Length

Set IPv6 prefix length.

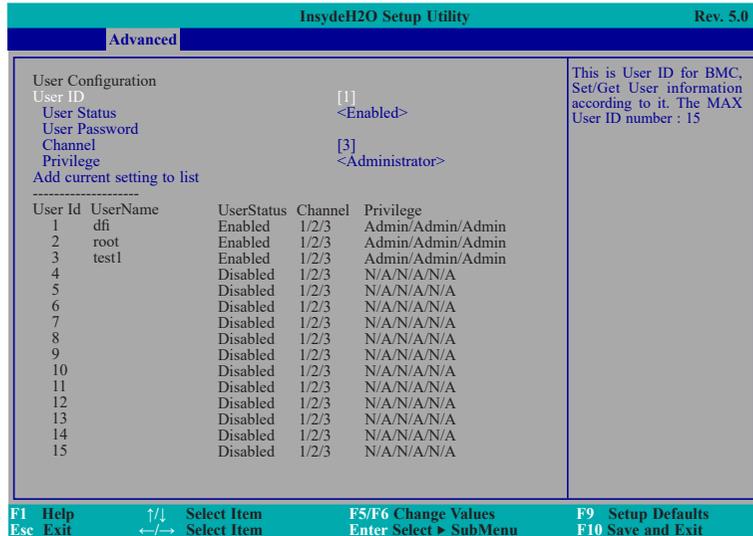
IPv6 Static IP Address

Enter the BMC IPv6 IP Address.

IPv6 Gateway Address

Enter the BMC IPv6 Gateway Address.

► **Advanced** ► **H2O IPMI Configuration**
 ► **BMC Configuration** ► **User Configuration**



User ID

Enter a number between 1 to 15 for the user ID number.

User Status

Enable or disable the user status.

User Password

Enter the user password.

Channel

Enter the LAN channel number for BMC. The valid LAN channel number is 1, 2, or 3.

Privilege

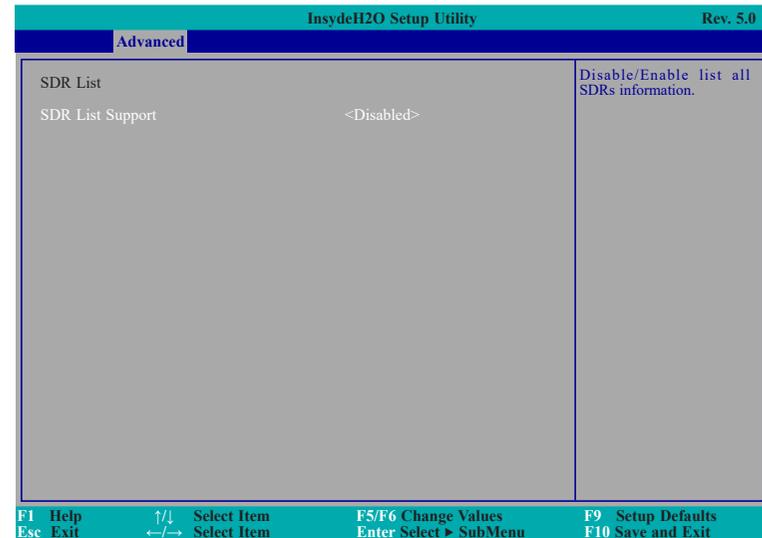
Select the privilege: Reserved, Callback, User, Operator, Administrator, or No Access.

Add current setting to list

Select this field and press Enter to add current setting to list.

► **Advanced** ► **H2O IPMI Configuration**
 ► **SDR List**

This section displays all SDR information provided by BMC.



SDR List Support

Enable or disable to list all SDR information. Examples of the SDR information list is shown in the next page.

InsydeH2O Setup Utility Rev. 5.0

Advanced

SDR List Disable/Enable list all SDRs information.

SDR List Support <Enabled>

ID	Sensor Name	Value	Unit
► 000	P1 Therm Margin	50	°C
► 002	Pwr Unit Status	0	Discrete
► 003	Pwr Unit Redund	0	Discrete
► 004	IPMI Watchdog	0	Discrete
► 005	Physical Scrty	0	Discrete
► 006	SMI Timeout	0	Discrete
► 007	System Event Log	0	Discrete
► 008	PCH Temp	62	°C
► 009	BB BMC Temp	33	°C
► 010	Riser 1 Temp	34	°C
► 011	Riser 2 Temp	33	°C
► 012	Riser 3 Temp	33	°C
► 013	Riser 4 Temp	32	°C
► 014	Riser 5 Temp	32	°C
► 015	CPU Fan	7220	RPM
► 016	System Fan 1	0	RPM
► 017	System Fan 2	0	RPM
► 018	P1 Status	0	Discrete
► 019	P1 IMCsts	0	Discrete
► 020	P1 IIOsts	0	Discrete
► 021	PCH Status	0	Discrete
► 022	CPU Missing	0	Discrete
► 023	Button	0	Discrete
► 024	BMC FW Health	0	Discrete
► 025	MTT CPU1	0	unspecified
► 026	VBAT	2.942	V
► 027	P5V	4.636	V
► 028	P12V	11.570	V
► 029	P3V3	3.057	V

F1 Help ↑/↓ Select Item F5/F6 Change Values F9 Setup Defaults

Esc Exit ←/→ Select Item Enter Select ► SubMenu F10 Save and Exit

InsydeH2O Setup Utility Rev. 5.0

Advanced

► 008	PCH Temp	61	°C	Sensor Number: 0xE0 Lower Non-Critical Threshold: N/A Lower Critical Threshold: N/A Lower Non-Recoverable Threshold: N/A Upper Non-Critical Threshold: N/A Upper Critical Threshold: N/A Upper Non-Recoverable Threshold: N/A
► 009	BB BMC Temp	34	°C	
► 010	Riser 1 Temp	34	°C	
► 011	Riser 2 Temp	34	°C	
► 012	Riser 3 Temp	34	°C	
► 013	Riser 4 Temp	32	°C	
► 014	Riser 5 Temp	32	°C	
► 015	CPU Fan	6935	RPM	
► 016	System Fan 1	0	RPM	
► 017	System Fan 2	0	RPM	
► 018	P1 Status	0	Discrete	
► 019	P1 IMCsts	0	Discrete	
► 020	P1 IIOsts	0	Discrete	
► 021	PCH Status	0	Discrete	
► 022	CPU Missing	0	Discrete	
► 023	Button	0	Discrete	
► 024	BMC FW Health	0	Discrete	
► 025	MTT CPU1	0	unspecified	
► 026	VBAT	2.960	V	
► 027	P5V	4.636	V	
► 028	P12V	11.570	V	
► 029	P3V3	3.074	V	
► 030	5VSB	4.898	V	
► 031	P1V05_PCH_AUX	1.037	V	
► 032	PVNN_PCH_AUX	0.994	V	
► 033	PVDDQ_ABC	1.190	V	
► 034	PVDDQ_DEF	1.190	V	
► 035	PVCCIN_CPU0	1.770	V	
► 036	PVCCSA_CPU0	0.864	V	
► 037	PVCCIO_CPU0	0.994	V	
► 038	P1V8_PCH_AUX	1.796	V	
► 039	PGPPA_SB	0	V	
► 040	2V5SB	2.514	V	
► 041	1V0_AUX	0.987	V	

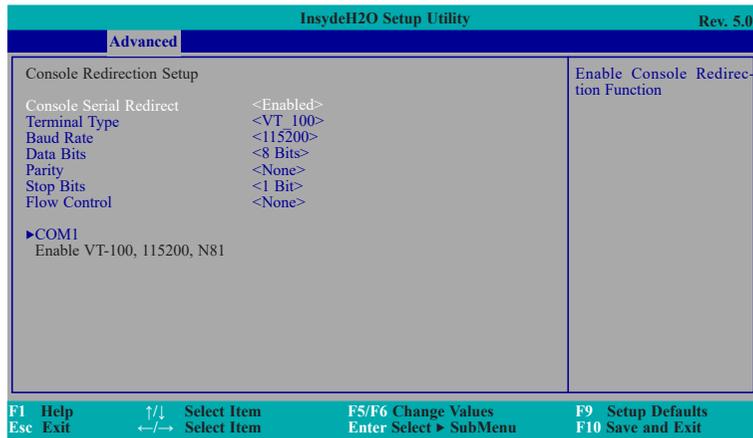
F1 Help ↑/↓ Select Item F5/F6 Change Values F9 Setup Defaults

Esc Exit ←/→ Select Item Enter Select ► SubMenu F10 Save and Exit

Scroll down to see the rest of the list.

► Advanced

Console Redirection

**Console Serial Redirect**

This field is used to enable or disable the console serial redirection function. When Console Serial Redirect is set to enabled, the screen will appear like below:

Terminal Type

Select terminal type: VT_100, VT_100+, VT_UTF8 or PC_ANSI.

Baud Rate

Select baud rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400 or 1200.

Data Bits

Select data bits: 7 bits or 8 bits.

Parity

Select parity bits: none, even or odd.

Stop Bits

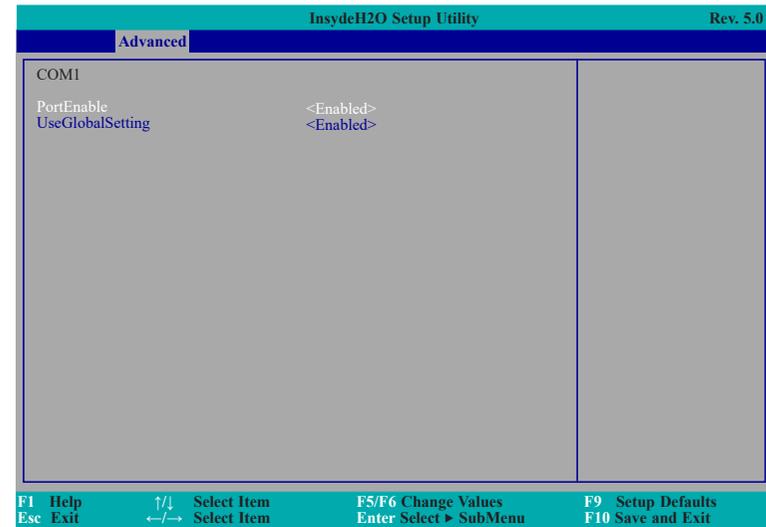
Select stop bits: 1 bit or 2 bits.

Flow Control

Select flow control type: none, RTS/CTS or XON/XOFF.

► Advanced ► Console Redirection

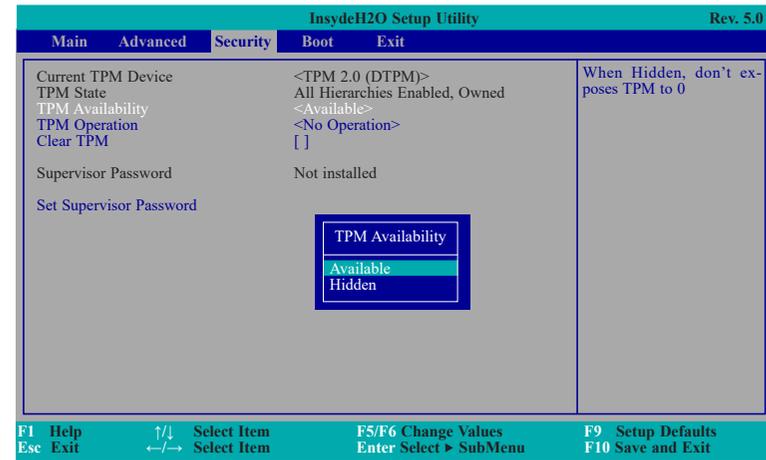
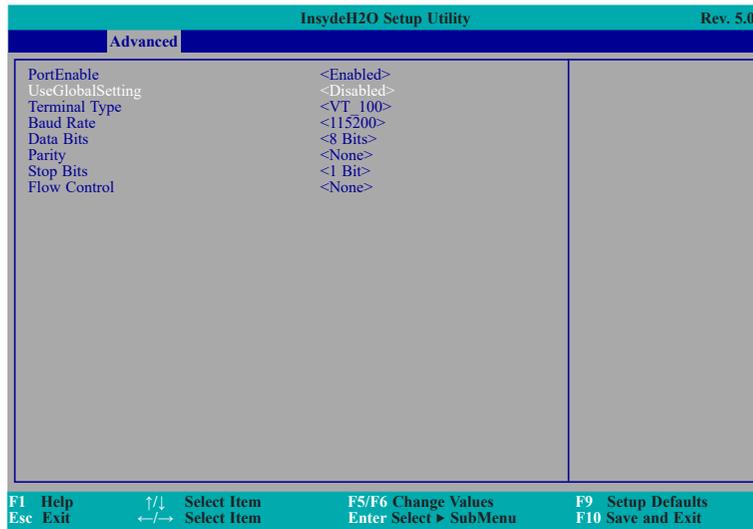
► COM1

**PortEnable**

This field is used to enable or disable the COM port to redirect the console.

UseGlobalSetting

This field is to enable or disable to use global setting. When the global setting is enabled, settings of the COM port will be the same as those under Console Redirection menu. When the global setting is disabled, serial configuration fields will appear, and the settings of the COM port can be configured independently. An example is given in the next page.

**TPM Availability**

Set the TPM availability.

TPM Operation

Select TPM operation.

Clear TPM

Remove all TPM context associated with a specific owner.

Set Supervisor Password

Set the supervisor's password. The length of the password must be greater than one character. To clear an installed password, input nothing in the new password field while setting the new password.

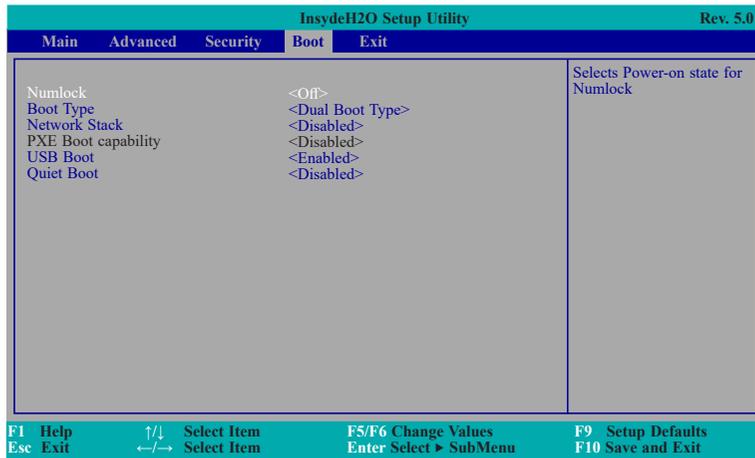
Power on Password

When a supervisor password is installed, this field will appear for configuration.

Disable Input of password is required when accessing the BIOS Setup Utility.

Enable Input of password is required during Power-on Self-test (POST).

► Boot



Numlock

Select the power-on state for numlock.

Boot Type

Select the boot type. The options are Dual Boot Type, Legacy Boot Type or UEFI Boot Type.

If you select "Dual Boot Type" or "UEFI Boot Type", the "Network Stack", "PXE Boot "capability", "USB Boot" and "Quiet Boot" will show up.

If you select "Legacy Boot Type", "PXE Boot to LAN", "USB Boot" and "Quiet Boot" will show up.



Note:

If the boot type is set to UEFI, the method for RAID volume creation will be different. Please refer to Chapter 5 – RAID for more information.

Network Stack

This field is used to enable or disable network stack.

PXE Boot capability

This field can only be configured when network stack is enabled.

Disabled Support Network Stack

UEFI IPv4/IPv6

Legacy Legacy PXE OPRM only

PXE Boot to LAN

Disable or enable PXE boot to LAN.

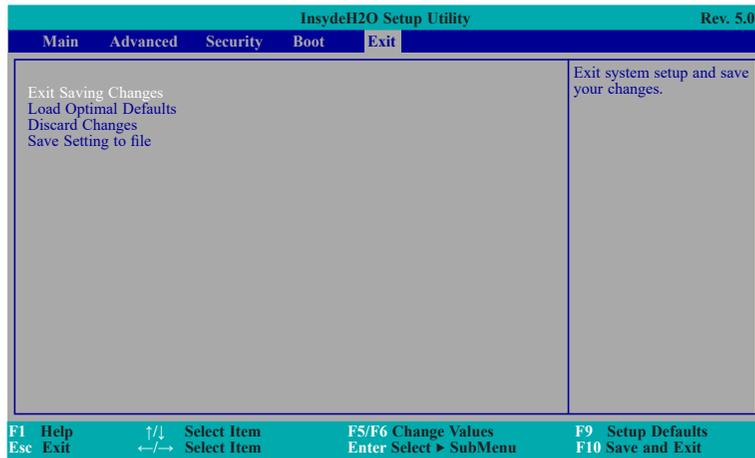
USB Boot

Enable or disable booting to USB boot devices.

Quiet Boot

Enable or disable booting in text mode.

► Exit



Exit Saving Changes

Select Yes and then press <Enter> to exit the system setup and save your changes.

Load Optimal Defaults

Select YES and then press <Enter> to load optimal defaults.

Discard Changes

Select YES and then press <Enter> to exit the system setup without saving your changes.

Save Setting to file

Select this option to save BIOS configuration settings to a USB flash device.

Restore Setting from file

This field will appear only when a USB flash device is detected. Select this field to restore setting from the USB flash device.

► Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files and specific instructions about how to update BIOS with the flash utility. For updating InsydeH2O BIOS in UEFI mode, you may refer to the how-to video at <https://www.dfi.com/tw/knowledge/video/31>.

► Notice: BIOS SPI ROM

1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.
2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.
3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.



Note:

- a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
- b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.

Chapter 4 - Supported Software

Install drivers, utilities and software applications that are required to facilitate and enhance the performance of the system board. You may acquire the software from your sales representatives, from an optional DVD included in the shipment, or from the website download page at <https://www.dfi.com/DownloadCenter>.

Intel Chipset Software Installation Utility

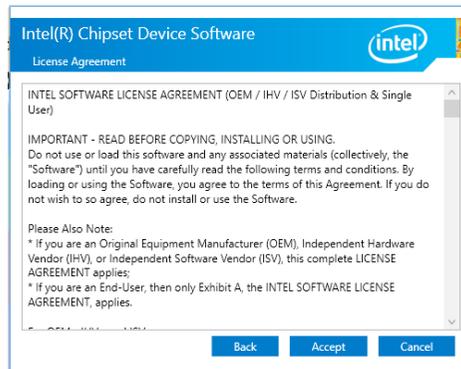
The Intel Chipset Software Installation Utility is used for updating Windows® INF files so that the Intel chipset can be recognized and configured properly in the system.

To install the utility, download "PL610 Chipset Driver" zip file at our website.

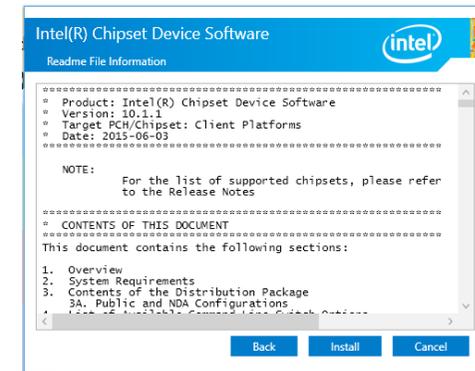
1. Setup is ready to install the utility. Click "Next".



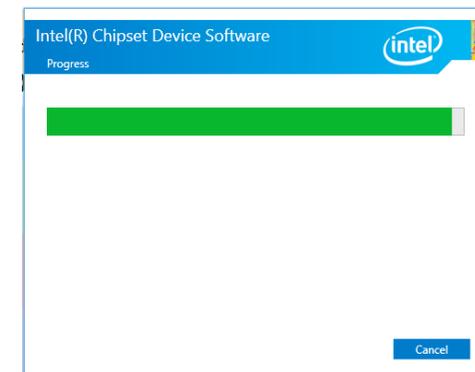
2. Read the license agreement then click "Accept".



3. Go through the readme document for more installation tips then click "Install".



4. The step displays the installing status in the progress.



5. After completing installation, click "Restart Now" to exit setup.

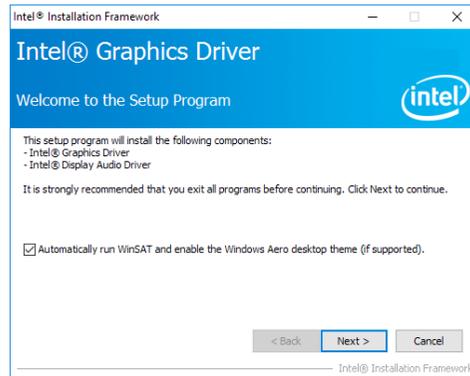
Restarting the system will allow the new software installation to take effect.



Intel Graphics Drivers

To install the driver, download “PL610 Graphics Driver” zip file at our website.

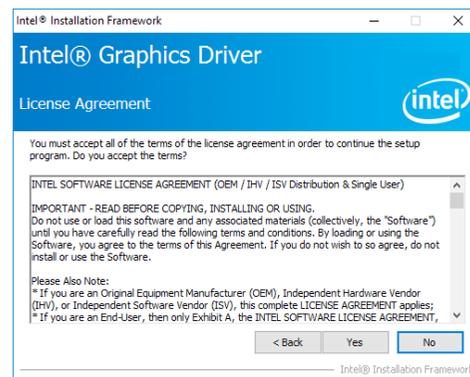
1. Setup is now ready to install the graphics driver. Click “Next”.



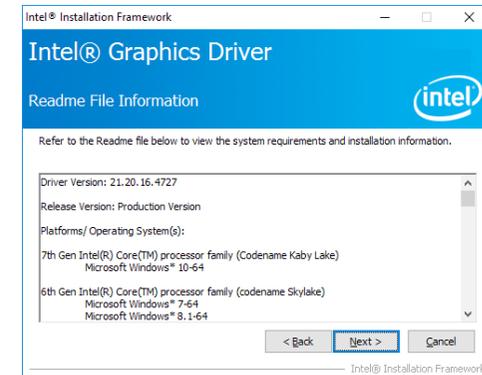
By default, the “Automatically run WinSAT and enable the Windows Aero desktop theme” is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 10 desktop appears. The “blank screen” period is the time Windows is testing the graphics performance.

We recommend that you skip this process by disabling this function then click “Next”.

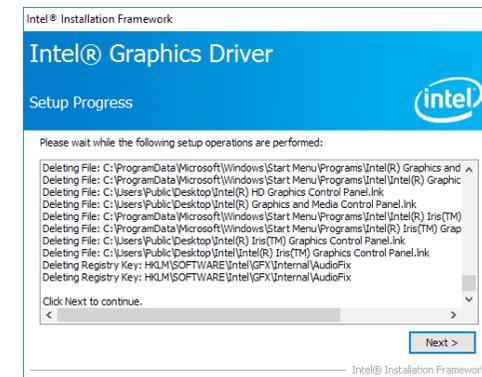
2. Read the license agreement then click “Yes”.



3. Go through the readme document for system requirements and installation tips then click “Next”.

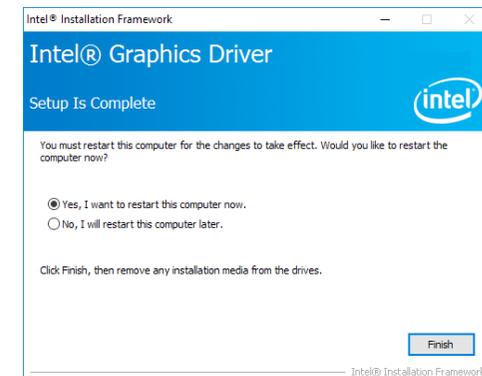


4. Setup is now installing the driver. Click “Next” to continue.



5. Click “Yes, I want to restart this computer now” then click “Finish”.

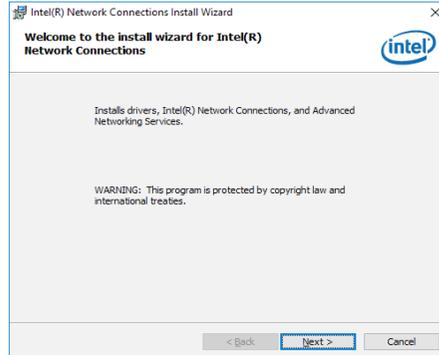
Restarting the system will allow the new software installation to take effect.



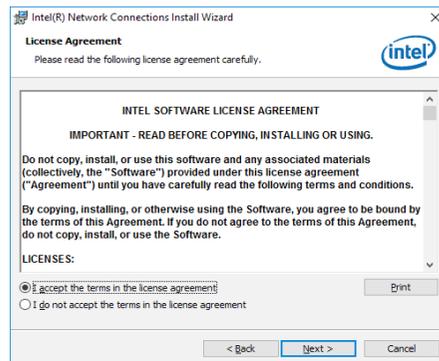
Intel LAN Drivers

To install the driver, download "PL610 LAN Driver" zip file at our website.

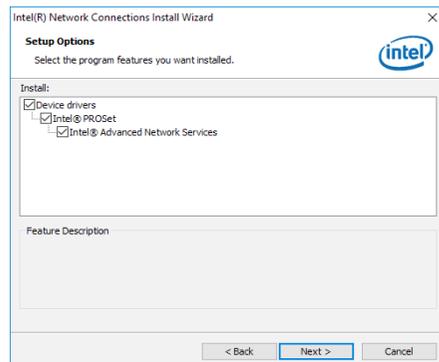
1. Setup is ready to install the driver. Click "Next".



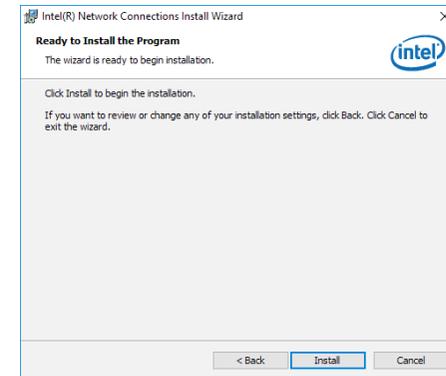
2. Click "I accept the terms in the license agreement" then click "Next".



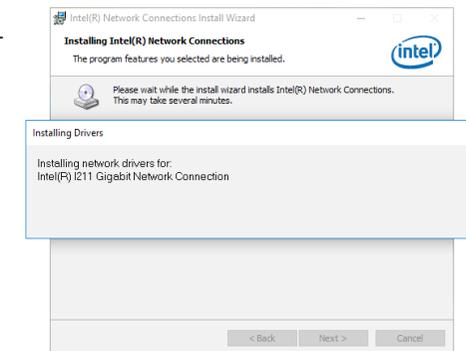
3. Select the program features you want installed then click "Next".



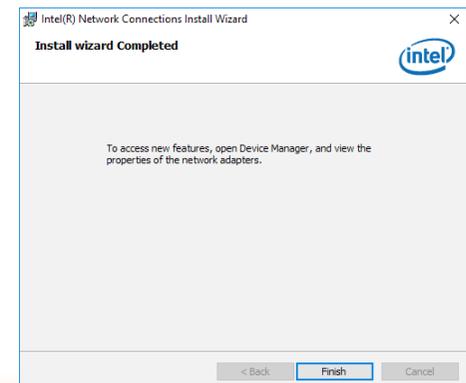
4. Click "Install" to begin the installation.



5. The step displays the installing status in the progress.



6. After completing installation, click "Finish".



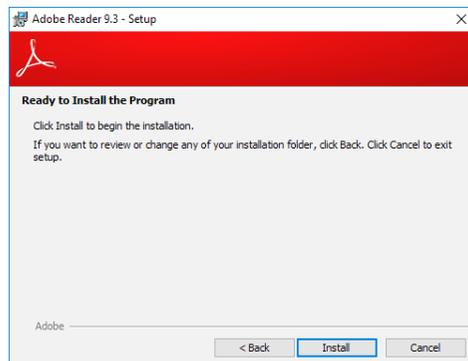
Adobe Acrobat Reader 9.3

To install the reader, download "PL610 Driver Package" iso file at our website. Click "Adobe Acrobat Reader 9.3".

1. Click "Next" to install or click "Change Destination Folder" to select another folder.



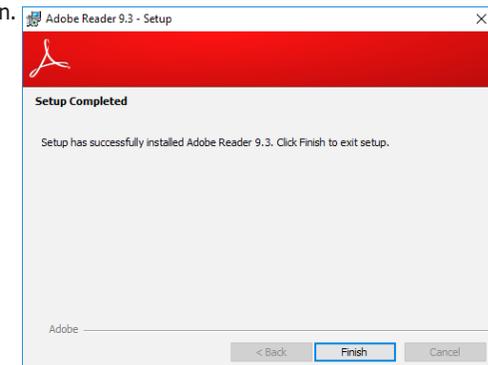
2. Click "Install" to begin installation.



3. Setup is now installing the driver.



4. Click "Finish" to exit installation.

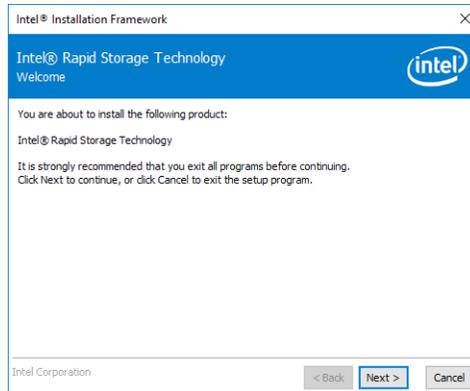


Intel Rapid Storage Technology

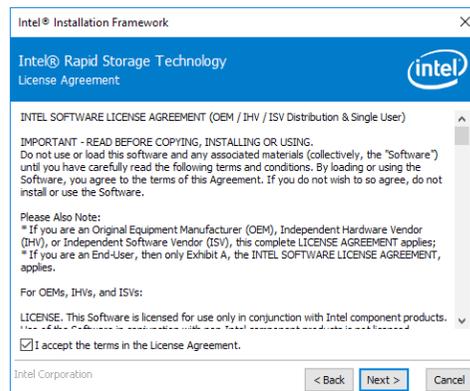
The Intel Rapid Storage Technology is a utility that allows you to monitor the current status of the SATA drives. It enables enhanced performance and power management for the storage subsystem.

To install the driver, download "PL610 RSTe Driver" zip file at our website.

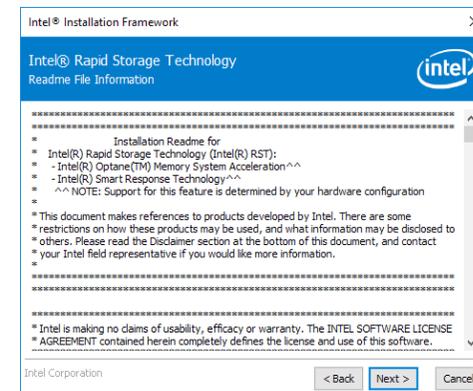
1. Setup is ready to install the utility. Click "Next".



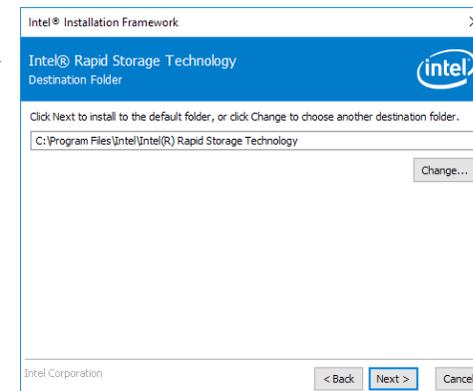
2. Read the license agreement and click "I accept the terms in the License Agreement". Then, click "Next".



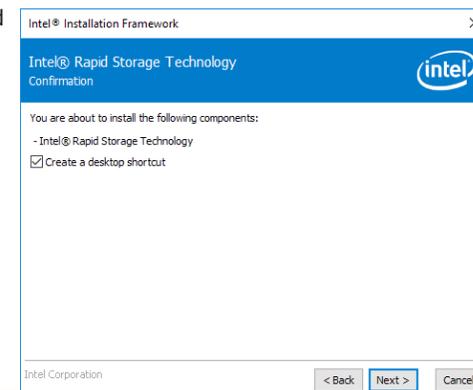
3. Go through the readme document to view system requirements and installation information then click "Next".



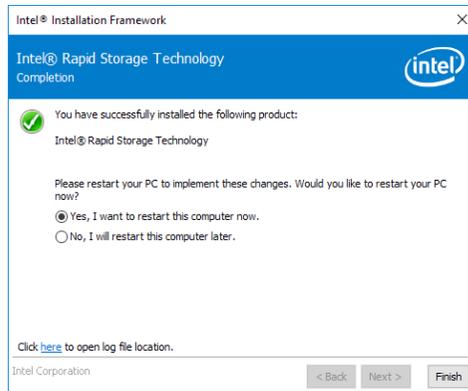
4. Click "Next" to install to the default folder or click "Change to choose another destination folder".



5. Confirm the installation and click "Next".



- Click "Yes, I want to restart this computer now" to complete the installation and then click "Finish".



Chapter 5 - RAID

The system board allows configuring RAID on Serial ATA drives. It supports RAID 0, RAID 1, RAID 5 and RAID 10.

RAID Levels

RAID 0 (Striped Disk Array without Fault Tolerance)

RAID 0 uses two new identical hard disk drives to read and write data in parallel, interleaved stacks. Data is divided into stripes and each stripe is written alternately between two disk drives. This improves the I/O performance of the drives at different channel; however it is not fault tolerant. A failed disk will result in data loss in the disk array.

RAID 1 (Mirroring Disk Array with Fault Tolerance)

RAID 1 copies and maintains an identical image of the data from one drive to the other drive. If a drive fails to function, the disk array management software directs all applications to the other drive since it contains a complete copy of the drive's data. This enhances data protection and increases fault tolerance to the entire system. Use two new drives or an existing drive and a new drive but the size of the new drive must be the same or larger than the existing drive.

RAID 5

RAID 5 stripes data and parity information across hard drives. It is fault tolerant and provides better hard drive performance and more storage capacity.

RAID 10 (Mirroring and Striping)

RAID 10 is a combination of data striping and data mirroring providing the benefits of both RAID 0 and RAID 1. Use four new drives or an existing drive and three new drives for this configuration.

RAID Level	Min. Drives	Protection	Description
RAID 0	2	None	Data striping without redundancy
RAID 1	2	Single Drive Failure	Disk mirroring
RAID 5	3	Single Drive Failure	Block-level data striping with distributed parity
RAID 10	4	1 Disk Per Mirrored Stripe (not same mirror)	Combination of RAID 0 (data striping) and RAID 1 (mirroring)

Settings

To enable the RAID function, the following settings are required.

1. Connect the Serial ATA drives.
2. Enable RAID in the Insyde BIOS.
3. Create a RAID volume.
- 3-1. Create a RAID volume if the boot type is UEFI.
4. Install the Intel Rapid Storage Technology Utility.

Step 1: Connect the Serial ATA Drives

Refer to chapter 2 for details on connecting the Serial ATA drives.



Important:

1. Make sure you have installed the Serial ATA drives and connected the data cables otherwise you won't be able to enter the RAID BIOS utility.
2. Treat the cables with extreme caution especially while creating RAID. A damaged cable will ruin the entire installation process and operating system. The system will not boot and you will lost all data in the hard drives. Please give special attention to this warning because there is no way of recovering back the data.

Step 2: Enable RAID in the Insyde BIOS

1. Power-on the system then press to enter the main menu of the Insyde BIOS.
2. Go to "Advanced" menu and select the "SATA Configuration" menu.
3. Change the "Configure SATA as" to "RAID" mode.
4. Save the changes in the "Exit" menu.
5. Reboot the system.

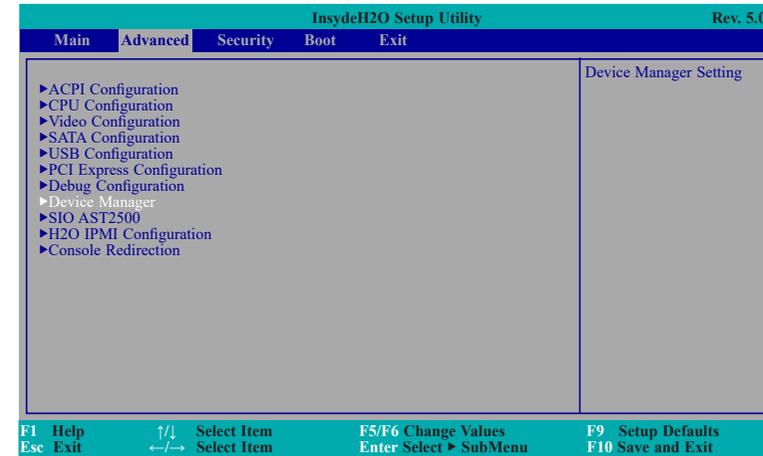
Step 3: Create a RAID Volume

1. When the Intel® RST option ROM status screen displays during POST, press <Ctrl> and <I> simultaneously to enter the option ROM user interface.
2. Select 1: Create RAID Volume and press <Enter>.
3. Create a volume name and press <Enter>.
4. Use the up or down arrow keys to select the RAID level and press <Enter>.
5. Use the up or down arrow keys to select the strip size and press <Enter>.
6. Select the capacity and press <Enter>. You must select less than one hundred percent of the available volume space to leave space for the second volume.
7. Press <Enter> to create the volume.
8. At the prompt, press <Y> to confirm volume creation.
9. Select 4: Exit and press <Enter>.
10. Press <Y> to confirm exit.

Step 3-1: Create a RAID Volume if the boot type is UEFI

If the boot type is set to UEFI, RAID volume creation will be different. Please use the following steps to create RAID volumes. To set the boot type, enter the Insyde BIOS and go to "Boot" > "Boot Type".

1. Go to the "Advanced" menu of the Insyde BIOS and select "Device Manager".



2. The screen displays all available drives. Select "Create RAID volume" to create a RAID volume".
3. Use the up or down arrow keys to select the RAID level and press <Enter>.
4. Use the up or down arrow keys to scroll through the list of hard drives and press <Enter> to select the drive.
5. Press <Enter>.
6. Use the up or down arrow keys to select the strip size and press <Enter>.
7. Enter the volume size and press <Enter>.
8. At the prompt, press <Y> to confirm volume creation.

Step 4: Install the Intel Rapid Storage Technology Utility

The Intel Rapid Storage Technology Utility can be installed from within Windows. It allows RAID volume management (create, delete, migrate) from within the operating system. It will also display useful SATA device and RAID volume information. The user interface, tray icon service and monitor service allow you to monitor the current status of the RAID volume and/or SATA drives. It enables enhanced performance and power management for the storage subsystem.

To install the driver, download "PL610 RSTe Driver" zip file at our website. Please refer to **Chapter 4** for more information.